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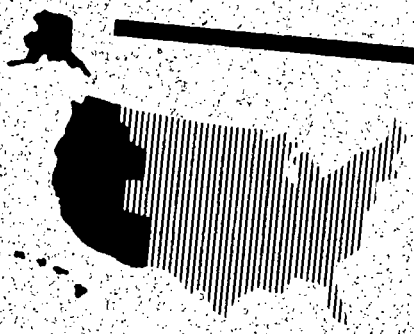

Remedial Activities at Selected Uncontrolled Hazardous Waste Sites in the Zone of Regions IX and X

FINAL REGIONAL GROUNDWATER FIELD SAMPLING PLAN REMEDIAL INVESTIGATION SAN FERNANDO VALLEY BASIN BURBANK, GLENDALE, AND LOS ANGELES, CALIFORNIA

EPA WA No. 68-W9-0031
December 1991

SFO69114.FI.FQ

Environmental Protection Agency
Contract No. 68-W9-0031

CH2M HILL

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FINAL REGIONAL GROUNDWATER FIELD SAMPLING PLAN
REMEDIAL INVESTIGATION

SAN FERNANDO VALLEY BASIN
BURBANK, GLENDALE, AND
LOS ANGELES, CALIFORNIA

EPA CONTRACT NO. 68-W9-0031
EPA WORK ASSIGNMENT NO. 31-03-9959
CH2M HILL PROJECT NO. SFO69114.FI.FQ

December 1991

SFO69114.FI.FQ

NONDISCLOSURE STATEMENT

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX (10/91)

Sample Plan Title: GROUNDWATER SAMPLING PLAN

Site Name: SAN FERNANDO VALLEY BASIN

Site Location: LOS ANGELES COUNTY

City/State/Zip: LOS ANGELES, CALIFORNIA

Site EPA ID #:

Anticipated Sampling Dates: JANUARY 1992 TO JANUARY 1993

Prepared By: Jess Brown and Peter Rude OCT 1991 (Date)

Agency or Firm: CH2M HILL, INC.

Address: 6425 CHRISTIE AVENUE, SUITE 500

City/State/Zip: EMERYVILLE, CALIFORNIA 94608

Telephone: 415/652-2426

EPA Project Officer: Kevin Mayer Section: H-6-1 415/744-2260 (Phone #)

QAPjp Approval Date:

* *

FOR

Received by Superfund Remedial Project Manager: Date

Reviewed by: Date

Approved/Not Approved Date

* *

Expedited Review? Yes/No

EPA

Received by Quality Assurance Management Section: Date

Reviewed by: Ronald P. Mansell

Approved/Not Approved 11/18/91 (Date)

Concurrence: Chief, Quality Assurance Management Section, Environmental Services Branch, OPM 11/18/91 (Date)

USE

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CONTENTS

CONTENTS (Continued)

List of Acronyms

AAS	Atomic Absorption Spectroscopy
bgs	Below Ground Surface
BNA	Base, Neutral, Acid Extractable Semi-Volatile Organic Chemical
BOW	Bottom of Well
cc	Cubic Centimeter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	Contract Laboratory Program
CW	Cluster Well
DCA	Dichloroethane
DHS	Department of Health Services
DI	Deionized Water
DL	Detection Limit
DCE	Dichloroethene
DQO	Data Quality Objective
DTW	Depth to Water
DUP	Duplicate Sample
DWR	Department of Water Resources
EC	Electrolytic Conductivity
FID	Flame Ionization Detector
FS	Feasibility Study
ft	Feet
GC/MS	Gas Chromatograph/Mass Spectrometer
gpm	Gallons per Minute
GSE	Ground Surface Elevation
GWE	Groundwater Elevation
ID	Inside Diameter
in	Inch
JMM	James M. Montgomery, Consulting Engineers, Inc.
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation District
LADWP	Los Angeles Department of Water and Power
LCS	Laboratory Control Standard
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
mg/l	Milligrams per Liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MW	Monitoring Well
N/A	Not Applicable
NA	Not Analyzed
ND	Not Detected
NPL	National Priorities List

List of Acronyms
(Continued)

NS	No Sample
OD	Outside Diameter
OU	Operable Unit
OW	Observation Well
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene or Perchloroethene or Tetrachloroethylene
PRP	Potentially Responsible Party
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RE	Reanalyzed Sample
RI	Remedial Investigation
RIN	Rinsate Water
ROW	Right-of-Way
SAL	State Action Level
SAP	Sampling and Analysis Plan
SFVGB	San Fernando Valley Groundwater Basin
SW	Solid Waste (EPA SW846 Methods Manual)
SWAT	Solid Waste Assessment Test
TB	Travel Bank
TCA	Trichloroethane
TCE	Trichloroethene or Trichloroethylene
THM	Trihalomethane
TM	Technical Memorandum
TSP	Trisodium Phosphate
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Chemical
VPB	Vertical Profile Boring
WL	Waste Liquid
µg/l	Micrograms per Liter

Section 1
OBJECTIVES OF SAMPLING EFFORT

INTRODUCTION

This sampling plan (SAP) presents the procedures for the quarterly sampling of 41 monitoring wells and annual sampling of 87 monitoring wells in the San Fernando Valley Groundwater Basin (SFVB). This work is part of the Remedial Investigation (RI) for the SFVB. This SAP addendum is an addendum to the SFVB previously prepared and submitted to EPA Region IX by James M. Montgomery, Consulting Engineers, Inc. (JMM), March 1989.

The SFVB contains four National Priorities List (NPL) sites: North Hollywood, Crystal Springs, Pollock, and Verdugo. Previous investigations have shown that groundwater contamination extends beyond the NPL site boundaries. Therefore, EPA has expanded the SFVB study area boundaries to include the eastern portion of the San Fernando Basin. The primary groundwater contaminants within the study area consist of the volatile organic compounds (VOCs), trichloroethene (TCE), and perchloroethene (PCE). The study area covers portions of the Cities of Los Angeles, Burbank, and Glendale, California, and unincorporated areas within Los Angeles County.

The wells to be sampled consist of 44 individual monitoring wells screened at different depths at 15 cluster well sites and 43 shallow vertical profile borings/monitoring wells (VPBs). The wells were installed by JMM during 1988 and 1989. Construction details and initial soil and water characterization data are found in a series of technical memorandums (JMM, 1990a,b,c,d, 1991a,b,c).

This SAP addendum includes the objectives of the sampling program, the site background, the rationale for groundwater monitoring, the rationale for sample locations, the number and frequency of samples to be collected, analytical parameters, and methods for obtaining samples.

OBJECTIVES

The objective of the groundwater SAP is monitor the horizontal and vertical extent of groundwater contamination beneath the SFVB site. The data collected during the groundwater sampling program will be used to estimate the extent of contamination and the rate of contaminant movement, and to assist in evaluating and selecting general response actions and remedial actions for contaminated groundwater.

Section 2
SITE BACKGROUND

SITE LOCATION

The SFVB study area is highly urbanized with residential and light industrial areas and the Burbank Airport. It is bounded by the Santa Monica Mountains on the south, Hollywood Freeway on the west, Verdugo Mountains on the north, and the Glendale Freeway on the east.

All of the 87 monitoring wells used in the sampling program are located throughout the study area within an 8-mile radius of each other.

PREVIOUS INVESTIGATIONS

In 1980, a water quality survey of selected Los Angeles Department of Water and Power (LADWP) production and observation wells revealed the presence of VOCs above California Department of Health Services (DHS) action levels in groundwater. These findings resulted in the closing of a number of LADWP wells and the blending of flows from selected wells with water from the Los Angeles Aqueduct (JMM, 1989).

A 2-year LADWP study, started in 1981, included field investigations, industrial site surveys, record and archive searches, literature reviews, and water quality analyses of more than 600 samples. Contamination in excess of United States Environmental Protection Agency (EPA) and DHS action levels was detected in about 45 percent of the LADWP supply wells in the eastern portion of the SFVB. Analyses of shallow groundwater samples collected from wells in 1988 detected maximum concentrations of PCE at 43,000 ppb and TCE at 7,800 ppb (JMM, 1989). TCE is present in the study area groundwater in average concentrations ranging from 5 to 50 ppb, with a maximum concentration ranging from 200 to 500 ppb. Average PCE concentrations range between 4 and 50 ppb, with a maximum level of 130 ppb (JMM, 1989). But, there are areas of elevated TCE and PCE contamination throughout the basin where VOC concentrations have been detected in the 10's of parts per million (ppm). Maximum Contaminant Levels (MCLs) for TCE and PCE are 5 parts per billion (ppb).

During the initial groundwater characterization of the 87 monitoring wells immediately after installation between November 1989 and January 1991, JMM used two different analytical suites. Table 2-1 presents Suite 1 and analytical methods used for North Hollywood VPBs (JMM, 1990a), Crystal Spring VPBs (JMM, 1990b), Pollock VPBs (JMM, 1990c), and Verdugo VPBs (JMM, 1990d), and Table 2-2 presents Suite 2 and analytical methods used for Crystal Springs cluster wells (JMM,

1991a), Pollock cluster wells (JMM, 1991b), and North Hollywood cluster wells (JMM, 1991c). Suite 2 added the analysis for radionuclides and water treatment parameters.

Table 2-1
JMM Laboratories Analytical Method References for Suite 1

Analyte	Water Method Number	Methodology
Volatile Organic Chemicals	EPA 524.2	Purge and Trap GC/MS
BNAs	EPA 625	GC/MS
Pesticides/PCBs	EPA 608	Gas Chromatography
Antimony	EPA 204.2	AAS
Arsenic	EPA 206.2	AAS
Beryllium	EPA 210.1	AAS
Cadmium	EPA 213.1	AAS
Chromium	EPA 218.1	AAS
Copper	EPA 220.1	AAS
Lead	EPA 239.2	AAS
Mercury	EPA 245.1	Cold Vapor AAS
Nickel	EPA 249.1	AAS
Selenium	EPA 270.2	AAS
Silver	EPA 272.1	AAS
Thallium	EPA 279.2	AAS
Zinc	EPA 289.1	AAS

Notes:

EPA - U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. 1983. *Methods for Chemical Analysis of Water and Wastes.* EPA-600/4-79-020. Cincinnati, OH, March 1983 for all EPA methods except EPA 608, EPA 524.2, and EPA 625.

EPA - *Federal Register.* 1984. Vol 49. No. 290. 26 October. 1984 43234 for EPA 608 and EPA 625.

EPA - U.S. Environmental Protection Agency. 1985. *Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water.* (Revised Sept. 1986) for EPA 524.2.

Table 2-2
JMM Laboratories Analytical Method References for Suite 2

Analyte	Water Method Number	Methodology
Volatile Organic Chemicals	EPA 524.2	Purge and Trap GC/MS
BNAs	EPA 625	GC/MS
Pesticides/PCBs	EPA 608	Gas Chromatography
Antimony	EPA 204.2	AAS
Arsenic	EPA 206.2	AAS
Beryllium	EPA 210.1	AAS
Cadmium	EPA 213.1	AAS
Chromium	EPA 218.1	AAS
Copper	EPA 220.1	AAS
Lead	EPA 239.2	AAS
Mercury	EPA 245.1	Cold Vapor AAS
Nickel	EPA 249.1	AAS
Selenium	EPA 270.2	AAS
Silver	EPA 272.1	AAS
Thallium	EPA 279.2	AAS
Zinc	EPA 289.1	AAS
Radon	Lucas Cell	
Gross Alpha	EPA 900.0	
Gross Beta	EPA 900.0	
Aluminum	EPA 200.7	
Alkalinity	EPA 310.1	
Calcium	EPA 200.7	
Chloride	EPA 300.0	
Conductance	EPA 120.1	
Fluoride	EPA 340.2	
Hardness (Ca + Mg)	EPA 200.7	
Magnesium	EPA 200.7	
Nitrate	EPA 300.0	
Potassium	EPA 200.7	
Sulfate	EPA 300.0	
pH	EPA 150.1	

Notes:

EPA - U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. 1983. *Methods for Chemical Analysis of Water and Wastes.* EPA-600/4-79-020. Cincinnati, OH, March 1983 for all EPA methods except EPA 608, EPA 524.2, and EPA 625.

EPA - *Federal Register.* 1984. Vol 49. No. 290. 26 October. 1984 43234 for EPA 608 and EPA 625.

EPA - U.S. Environmental Protection Agency. 1985. *Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water.* (Revised Sept. 1986) for EPA 524.2.

Results of the initial monitoring well characterization indicated that several water quality parameters were found to be above primary Federal and State MCLs. LADWP, in conjunction with JMM, sampled selected RI wells during two quarterly sampling events (January and April, 1991), and these data have been used to assist in selecting proposed sampling locations. LADWP/JMM's monitoring program originally consisted of quarterly sampling of all 44 cluster wells and 27 of the 42 VPBs (*Quarterly Sampling of Cluster Wells and VPB Wells, 1991)*. Nine VOCs, six metals, and one inorganic have been detected above MCLs (Table 2-3 through Table 2-5). Currently, there are no MCLs for radon; however, detected radon levels are reported in Table 2-4 for information purposes. No pesticides or PCBs have been detected in any of the wells.

Table 2-3
VOCs Detected Above Primary MCL

Well Name	Benzene (1.0 µg/l)[a]	Carbon Tetrachloride (0.5 µg/l)[a]	1,1-Dichloroethane (5 µg/l)[a]	1,2-Dichloroethane (0.5 µg/l)[a]	1,1-Dichloroethene (6 µg/l)[a]	1,1,2,2-Tetrachloroethane (1 µg/l)[a]	Perchloroethene (PCE) (5 µg/l)[a]	Trichloroethene (TCE) (5 µg/l)[a]	cis-1-2-Dichloroethene (6 µg/l)[a]
CS-C01-105							120.0	93.0	
CS-C01-285							120.0	220.0	
CS-C02-062						8	120.0	200.0	
CS-C02-180						2	36.0	190.0	
CS-C02-250		1.0				2	36.0	150.0	
CS-C02-335		0.5					26.0	130.0	
CS-C03-100		10.0			26		6.0	1,000.0	
CS-C04-290							5.0	10.0	
CS-C04-382							8.0	29.0	
CS-C05-160		1.0						40.0	
CS-C05-290							6.0	31.0	
CS-VPB-01						24	120.0	120.0	
CS-VPB-02								14.0	
CS-VPB-04	2.0	69.0	49	3.0	440	3	81.0	5,500.0	
CS-VPB-05		25.0	18		170	94	56.0	960.0	
CS-VPB-06							7.0	45.0	
CS-VPB-07	2.0	110.0	15	2.1	230		40.0	6,000.0	14.0
CS-VPB-08		3.0					5.0	93.0	
CS-VPB-010		0.7							
CS-VPB-011		1.0				3	59.0	7.0	
NH-C01-325							12.0		
NH-C02-220		2.0							
NH-C02-325		5.0		33.0			6.0	29.0	
NH-C03-580								29.0	

Table 2-3
VOCs Detected Above Primary MCL

Well Name	Benzene (1.0 µg/l)[a]	Carbon Tetrachloride (0.5 µg/l)[a]	1,1-Dichloroethane (5 µg/l)[a]	1,2-Dichloroethane (0.5 µg/l)[a]	1,1-Dichloroethene (6 µg/l)[a]	1,1,2,2-Tetrachloroethane (1 µg/l)[a]	Perchloroethene (PCE) (5 µg/l)[a]	Trichloroethene (TCE) (5 µg/l)[a]	cis-1-2-Dichloroethene (6 µg/l)[a]
NH-C04-240								6.0	
NH-C06-160								50.0	
NH-VPB-01						3	120.0	220.0	
NH-VPB-05				4.0					
NH-VPB-06								10.0	
NH-VPB-07			19	3.0		5	75.0	38.0	
NH-VPB-08								12.0	
NH-VPB-09	0.6	1.0							
NH-VPB-14		3.0		180.0				740.0	
PO-C02-052				3.0				23.0	
PO-C03-182								6.0	
PO-VPB-01							5.0	27.0	
PO-VPB-02		1.0		5.0	41	24	140.0	820.0	
PO-VPB-03						6	40.0	75.0	
PO-VPB-07							9.0	120.0	
PO-VPB-08			12						

[a] #µg/l = MCL

Table 2-4
Inorganic Analytes Detected Above Primary MCL

Well Name	Nitrate (45 mg/l)[a]	Radon (--) (pci/l)
CS-C01-105	51.5	230
CS-C01-285		340
CS-C01-558		170
CS-C02-062	70.4	485
CS-C02-180		240
CS-C02-250		410
CS-C02-335		250
CS-C03-100		145
CS-C03-325		290
CS-C03-465		145
CS-C03-550		160
CS-C04-290		700
CS-C04-382		260
CS-C04-520		400
CS-C05-160		90
CS-C05-290		110
CS-C06-185		35
CS-C06-278		175
NH-C01-325		180
NH-C01-450		590
NH-C01-660		530
NH-C01-780		235
NH-C02-220	62.9	165
NH-C02-325		2.8
NH-C02-520		3.6
NH-C02-681		195
NH-C03-380		550
NH-C03-580		230
NH-C03-680		88
NH-C03-800		220

Table 2-4
Inorganic Analytes Detected Above Primary MCL

Well Name	Nitrate (45 mg/l)[a]	Radon (--) (pci/l)
NH-C04-240		560
NH-C04-375		270
NH-C04-560		120
NH-C05-320	88.0	75
NH-C05-460		25
NH-C06-160	52.8	55
NH-C06-285		200
NH-C06-425		120
PO-C01-354		710
PO-C02-052		110
PO-C03-182		550
PO-C03-235		380
CS-VPB-04	48.4	250
CS-VPB-05	48.4	115
CS-VPB-06	53.0	245
NH-VPB-04	48.4	
NH-VPB-06	57.2	
NH-VPB-13	74.8	
NH-VPB-14	70.4	610
PO-VPB-02	70.8	480
PO-VPB-03	52.8	290
PO-VPB-10	52.8	
VD-VPB-01	70.4	
VD-VPB-02	70.4	
VD-VPB-06	52.8	

[a]#µg/l = MCL

Table 2-5
Metals Detected Above Primary MCL

Well Name	Lead (0.05 mg/l)[a]	Mercury (0.002 mg/l)[a]	Arsenic (0.05 mg/l)[a]	Selenium (0.01 mg/l)[a]	Cadmium (0.005 mg/l)[a]	Chromium (0.05 mg/l)[a]	Aluminum (1 mg/l)[a]
CS-C01-105							5.0
CS-C02-062							16.0
CS-C02-180							12.0
CS-C02-335							5.8
CS-C03-100							6.3
CS-C03-325							4.2
CS-C03-465							7.0
CS-C03-550							1.1
CS-C04-290							2.6
CS-C04-382							6.2
CS-C04-520							1.6
NH-C01-325							3.0
NH-C01-450							4.4
NH-C01-660							6.7
NH-C01-780							9.0
NH-C02-220							11.0
NH-C02-325							6.2
NH-C02-520							4.0
NH-C02-681							2.2

Table 2-5
Metals Detected Above Primary MCL

Well Name	Lead (0.05 mg/l)[a]	Mercury (0.002 mg/l)[a]	Arsenic (0.05 mg/l)[a]	Selenium (0.01 mg/l)[a]	Cadmium (0.005 mg/l)[a]	Chromium (0.05 mg/l)[a]	Aluminum (1 mg/l)[a]
NH-C03-380							4.3
NH-C03-580							4.4
NH-C03-680							2.5
NH-C03-800							1.7
NH-C04-240							4.6
NH-C04-375							1.3
NH-C05-320							6.0
NH-C05-460							16.0
NH-C06-160							8.5
NH-C06-285							6.3
PO-C01-195							3.5
PO-C01-354							3.7
PO-C02-052							2.9
PO-C02-205							4.8
PO-C03-182							7.3
PO-C03-235							7.4
CS-C02-250	0.0910	0.0080					
CS-VPB-01	0.0550	0.0034	0.0950		0.0060	0.0990	
CS-VPB-02			0.0500				

Table 2-5
Metals Detected Above Primary MCL

Well Name	Lead (0.05 mg/l)[a]	Mercury (0.002 mg/l)[a]	Arsenic (0.05 mg/l)[a]	Selenium (0.01 mg/l)[a]	Cadmium (0.005 mg/l)[a]	Chromium (0.05 mg/l)[a]	Aluminum (1 mg/l)[a]
CV-VPB-04			0.0890			0.0700	15.0
CS-VPB-05					0.0140	0.0600	
CS-VPB-06		0.0034					
CS-VPB-08		0.0035	0.0590	0.0190		0.0720	
CS-VPB-09			0.0850			0.1200	
CS-VPB-10				0.0180	0.0060	0.0730	
CS-VPB-11			0.1150			0.0830	
NH-C04-560				0.0140			1.4
NH-C06-425				0.0100			4.3
NH-VPB-01			0.0820		0.0230	0.0890	
NH-VPB-03			0.0620			0.0530	
NH-VPB-06		0.0026			0.0100		
NH-VPB-09					0.0300		
NH-VPB-11					0.0330	0.0860	
NH-VPB-12			0.1300			0.1100	
NH-VPB-13						0.0610	
NH-VPB-14	0.0560	0.0037	0.4400	0.0100		0.1600	10.0
PO-VPB-01						0.0680	
PO-VPB-02		0.0470				1.2000	2.2

Table 2-5
Metals Detected Above Primary MCL

Well Name	Lead (0.05 mg/l)[a]	Mercury (0.002 mg/l)[a]	Arsenic (0.05 mg/l)[a]	Selenium (0.01 mg/l)[a]	Cadmium (0.005 mg/l)[a]	Chromium (0.05 mg/l)[a]	Aluminum (1 mg/l)[a]
PO-VPB-03							2.8
PO-VPB-05						0.0720	
PO-VPB-07		0.0040					
VD-VPB-01			0.0830				
VD-VPB-05			0.0990				
VD-VPB-06			0.0800				
VD-VPB-07						0.0790	

[a]#mg/l = MCL

Section 3
GROUNDWATER SAMPLING LOCATION MAPS

The maps described below as Figures 3-1 through 3-4 provide an overview of the SFVB study area and the proposed groundwater sampling locations:

- **Figure 3-1--Site Location Map**--Identifies the geographic location of the SFVB study area.

- **Figure 3-2--RI Well Locations**--Identifies the 15 cluster well sites (44 monitoring wells) and the 43 VPBs in the SFVB study area.

- **Figure 3-3--RI Well Locations for Quarterly Sampling**--Identifies the location of the 41 monitoring wells in the SFVB study area that are scheduled for quarterly sampling.

- **Figure 3-4--RI Well Locations for Annual Sampling**--Identifies the location of 87 monitoring wells in the SFVB study area that are scheduled for annual sampling.

Appendix A contains the Thomas Guide Street Maps of each well location to supplement the figures described above. Appendix A also contains a description of the monitoring well locations according to well location; the nearest street to the well location and nearest major cross street; the specific location of each well, e.g., in the street, parkway, sidewalk, etc.; the city where the well is located; the 1991 Thomas Guide Street Guide map page; and the sampling frequency of each well.

Detailed scaled drawings of each monitoring well location are found in Appendix B.

SAN FERNANDO VALLEY GROUNDWATER SAMPLING PLAN

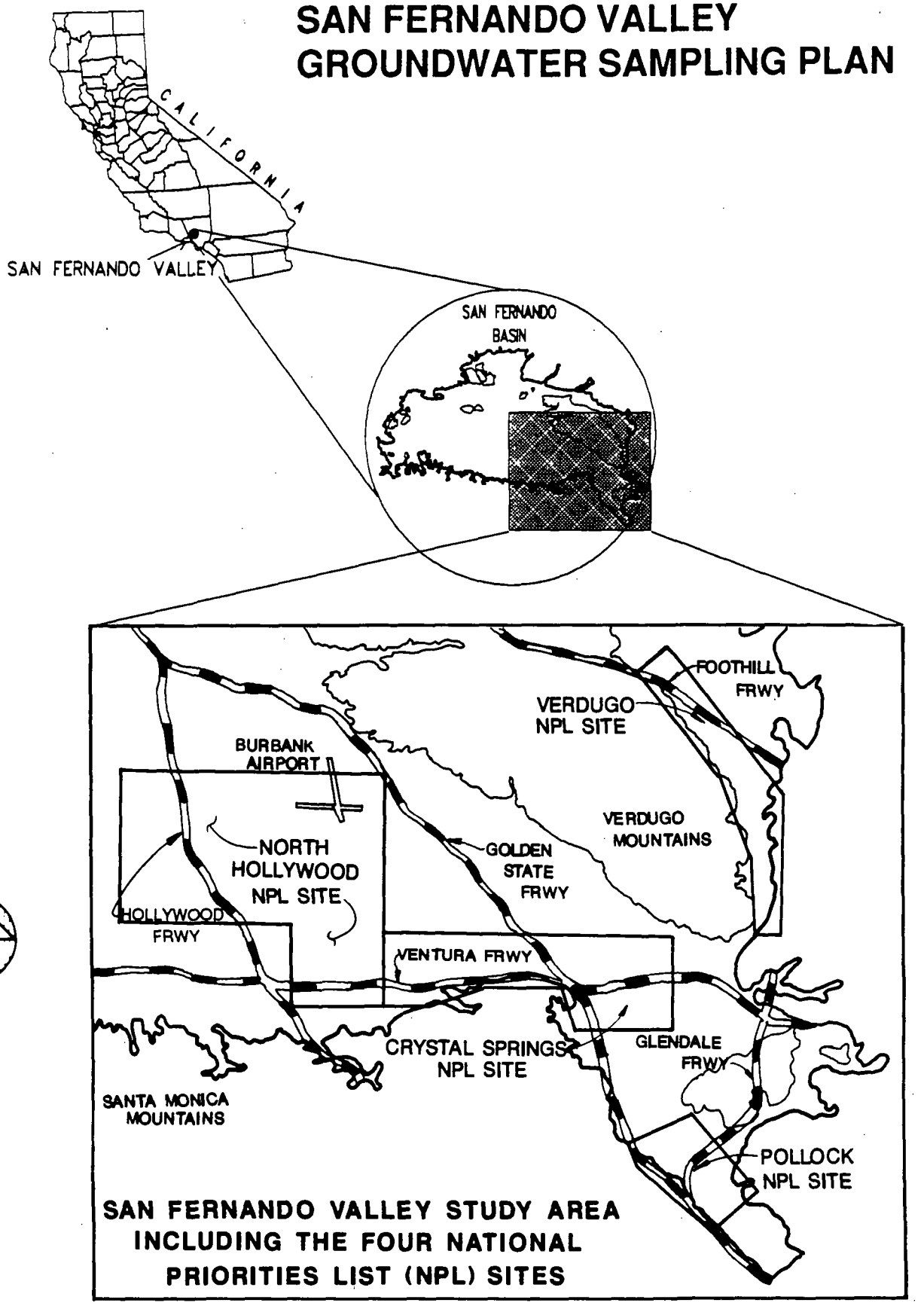
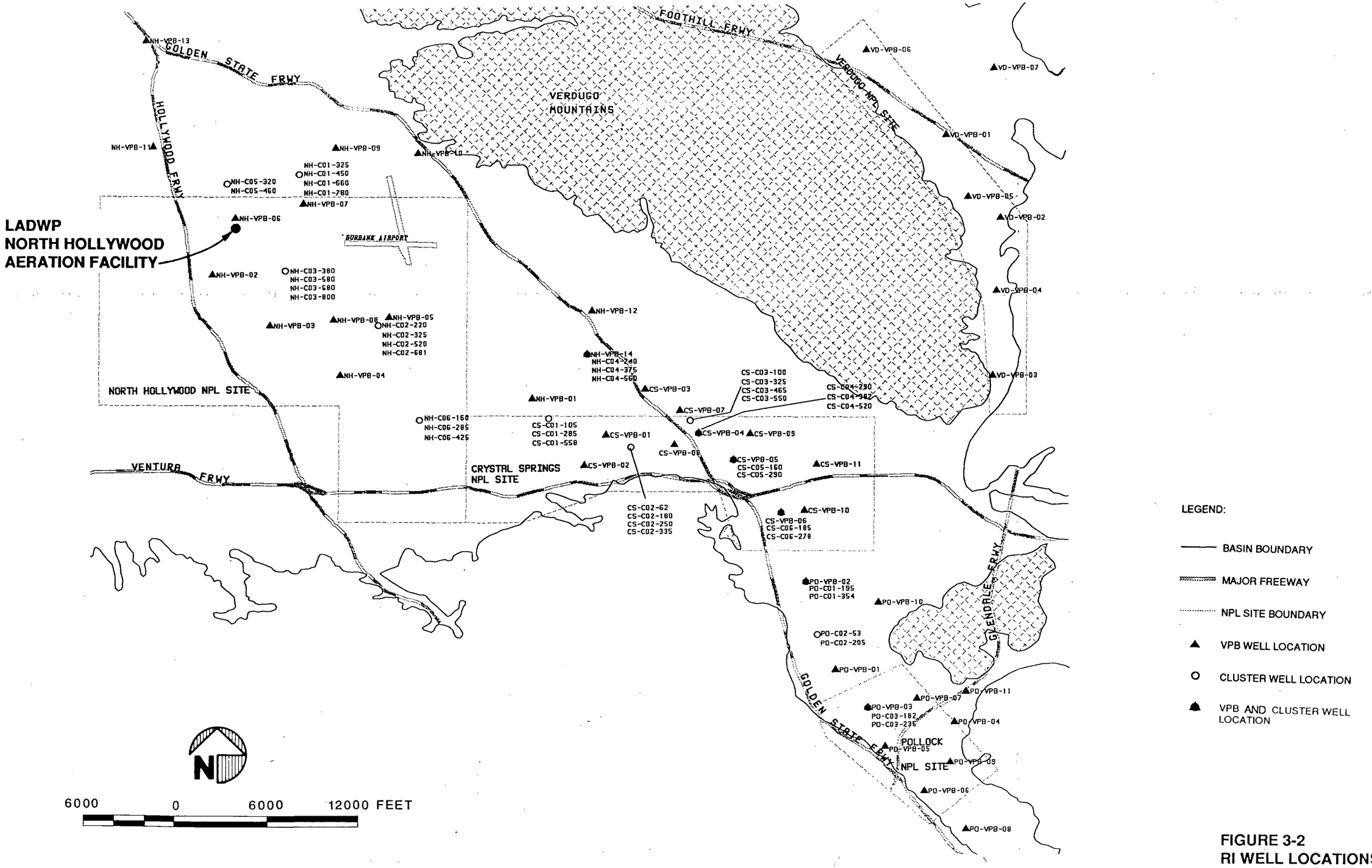


FIGURE 3-1
SITE LOCATION MAP
SAN FERNANDO VALLEY BASIN



LEGEND:

- BASIN BOUNDARY
- MAJOR FREEWAY
- NPL SITE BOUNDARY
- ▲ VPB WELL LOCATION
- O CLUSTER WELL LOCATION
- ▲ VPB AND CLUSTER WELL LOCATION

FIGURE 3-2
RI WELL LOCATIONS
SAN FERNANDO VALLEY BASIN

SFO69114.FI.FQ OCTOBER 1991

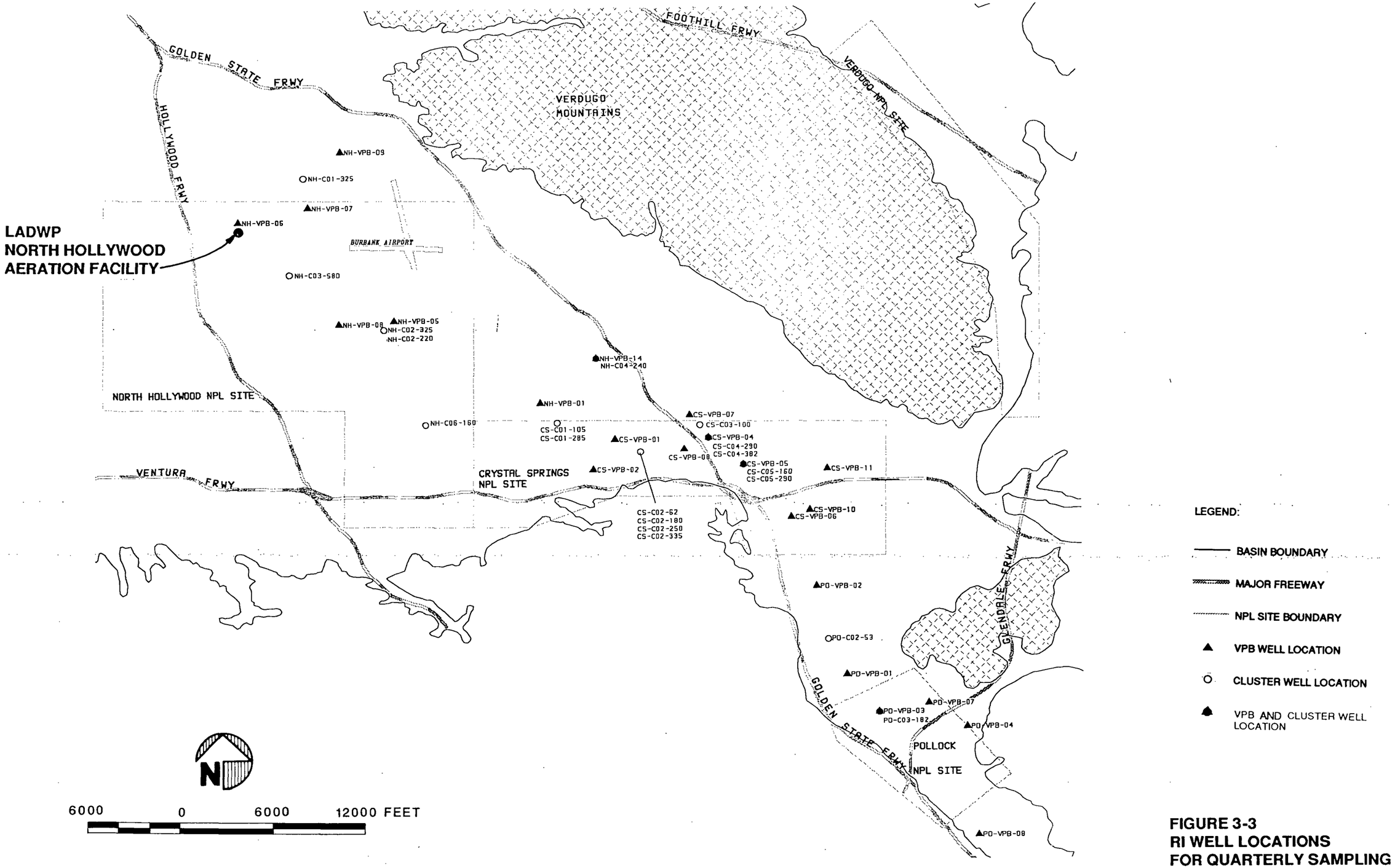
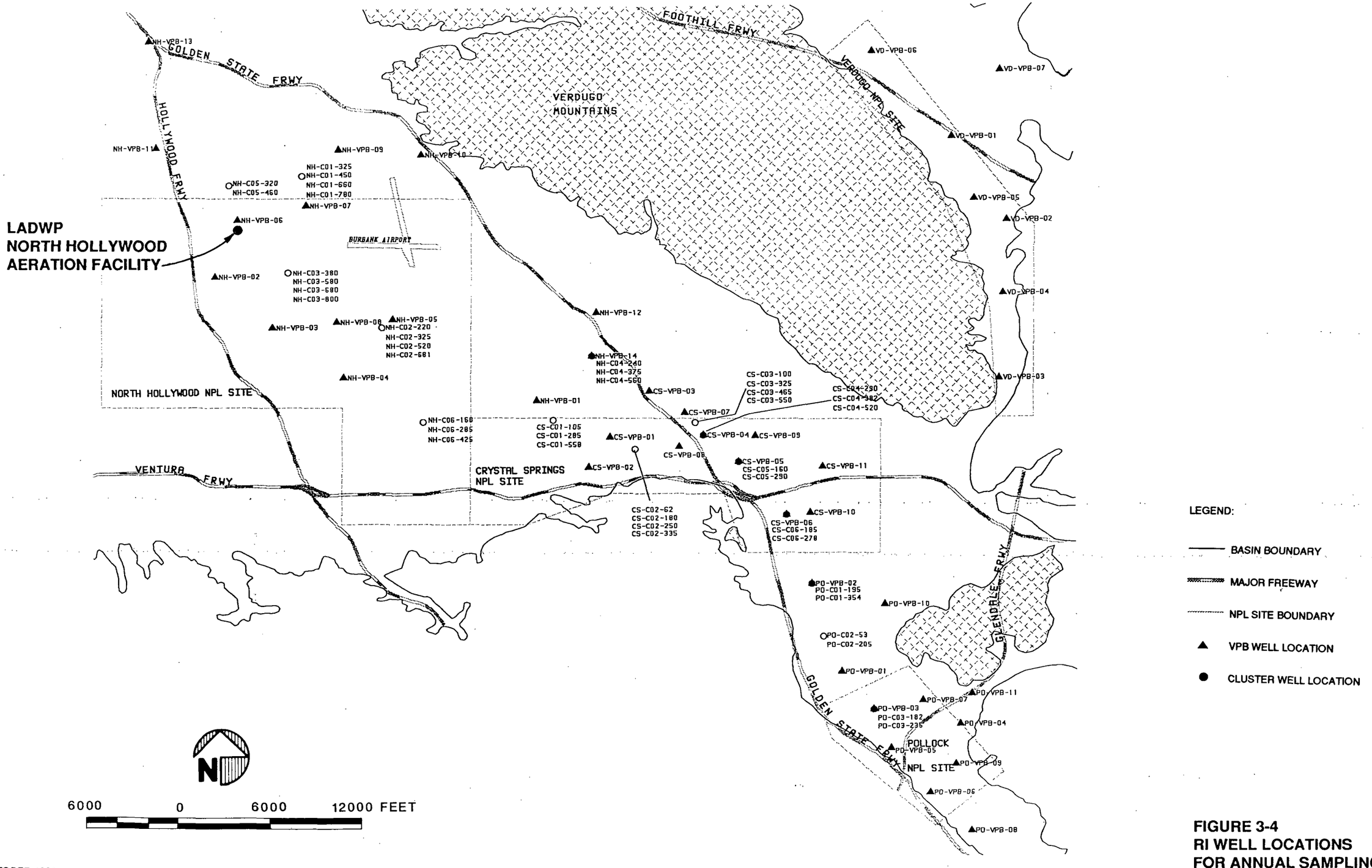


FIGURE 3-3
RI WELL LOCATIONS
FOR QUARTERLY SAMPLING
SAN FERNANDO VALLEY BASIN

SFO69114.FI.FQ OCTOBER 1991



LEGEND:

- BASIN BOUNDARY
- MAJOR FREEWAY
- NPL SITE BOUNDARY
- ▲ VPB WELL LOCATION
- ● CLUSTER WELL LOCATION

FIGURE 3-4
RI WELL LOCATIONS
FOR ANNUAL SAMPLING
SAN FERNANDO VALLEY BASIN

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Section 4
RATIONALE FOR SAMPLING LOCATIONS, NUMBER OF SAMPLES, AND ANALYTICAL PARAMETERS

SAMPLING LOCATIONS

As part of the development of this recommended monitoring program, available contaminant data, well construction details, water level data, and zones of groundwater contamination maps were compiled and reviewed. VOC contaminant data, well construction information, and water level data were obtained from CH2M HILL's San Fernando Valley Geographical Information System (SFVGIS) data base.

VOC contaminant data have been used to separate RI wells into two categories: those recommended to be sampled quarterly, and those recommended to be sampled annually (CH2M HILL, 1991). A total of 41 RI wells are recommended to be sampled every quarter on the following basis:

- Previous sampling indicate concentrations of TCE, PCE, or other VOCs in excess of Federal and State MCLs.

In addition to the 41 wells that will be sampled on a quarterly basis, an additional 46 will be sampled on an annual basis. These additional 46 RI wells are recommended for the following reasons:

- Previous sampling indicates detectable concentrations of TCE, PCE, or other VOCs, but below MCLs. A total of 20 wells were identified on this basis.

- Previous sampling indicates nondetectable concentrations of VOCS. A total of 26 wells were identified on this basis. These wells are recommended for sampling because only one to four samples have been obtained to date, and additional samples are needed to better characterize groundwater contamination. If future sampling indicates continued nondetectable concentrations of contaminants within these wells, then EPA may decide to remove these wells from the monitoring program after three nondetects have occurred.

Table 4-1 identifies the 41 monitoring wells that will be sampled on a quarterly basis (see Figure 3-3 for locations). Table 4-2 identifies 87 monitoring wells that will be sampled on an annual basis. This includes the 41 wells sampled on a quarterly basis plus 46 additional wells (see Figure 3-4 for locations). The sampling program will need to be periodically reevaluated and revised as new data become available. For example,

Table 4-1
San Fernando Valley Basin
Monitoring Wells Included in Quarterly Sampling Events

Well Site	Well Name	Well Site	Well Name
Crystal Spring Wells		**North Hollywood VPBs**	
	CS-C01-105		NH-VPB-01
	CS-C01-285		NH-VPB-05
	CS-C02-62		NH-VPB-06
	CS-C02-180		NH-VPB-07
	CS-C02-250		NH-VPB-08
	CS-C02-335		NH-VPB-09
	CS-C03-100		NH-VPB-14
	CS-C04-290		
	CS-C04-382		
	CS-C05-160	**Pollock VPBs**	
	CS-C05-290		PO-VPB-01
			PO-VPB-02
North Hollywood Wells			PO-VPB-03
	NH-C01-325		PO-VPB-04
	NH-C02-220		PO-VPB-07
	NH-C02-325		PO-VPB-08
	NH-C03-580	**Crystal Springs VPBs**	
	NH-C04-240		CS-VPB-01
	NH-C06-160		CS-VPB-02
Pollock Wells			CS-VPB-04
	PO-C02-53		CS-VPB-05
	PO-C03-182		CS-VPB-06
			CS-VPB-07
			CS-VPB-08
			CS-VPB-10
			CS-VPB-11

Table 4-2
San Fernando Valley Basin
Monitoring Wells Included in Annual Sampling Event

Well Site	Well Name	Well Site	Well Name
Crystal Spring Wells		**North Hollywood Wells**	
	CS-C01-105		NH-C01-325
	CS-C01-285		NH-C01-450
	CS-C01-558		NH-C01-660
	CS-C02-62		NH-C01-780
	CS-C02-180		NH-C02-220
	CS-C02-250		NH-C02-325
	CS-C02-335		NH-C02-520
	CS-C03-100		NH-C02-681
	CS-C03-325		NH-C03-380
	CS-C03-465		NH-C03-580
	CS-C03-550		NH-C03-680
	CS-C04-290		NH-C03-800
	CS-C04-382		NH-C04-240
	CS-C04-520		NH-C04-375
	CS-C05-160		NH-C04-560
	CS-C05-290		NH-C05-320
	CS-C06-185		NH-C05-460
	CS-C06-278		NH-C06-160
			NH-C06-285
			NH-C06-425
Pollock Wells		**Verdugo VPBs**	
	PO-C01-195		VD-VPB-01
	PO-C01-354		VD-VPB-02
	PO-C02-53		VD-VPB-03
	PO-C02-205		VD-VPB-04
	PO-C03-182		VD-VPB-05
	PO-C03-235		VD-VPB-06
			VD-VPB-07

Table 4-2
San Fernando Valley Basin
Monitoring Wells Included in Annual Sampling Event

Well Site	Well Name	Well Site	Well Name
North Hollywood VPBs		**Pollock VPBs**	
	NH-VPB-01		PO-VPB-01
	NH-VPB-02		PO-VPB-02
	NH-VPB-03		PO-VPB-03
	NH-VPB-04		PO-VPB-04
	NH-VPB-05		PO-VPB-05
	NH-VPB-06		PO-VPB-06
	NH-VPB-07		PO-VPB-07
	NH-VPB-08		PO-VPB-08
	NH-VPB-09		PO-VPB-09
	NH-VPB-10		PO-VPB-10
	NH-VPB-11		PO-VPB-11
	NH-VPB-12		
	NH-VPB-13		
	NH-VPB-14		
Crystal Springs VPBs			
	CS-VPB-01		
	CS-VPB-02		
	CS-VPB-03		
	CS-VPB-04		
	CS-VPB-05		
	CS-VPB-06		
	CS-VPB-07		
	CS-VPB-08		
	CS-VPB-09		
	CS-VPB-10		
	CS-VPB-11		

quarterly sampling of a well currently recommended to be sampled annually may be warranted if contaminant concentrations increase above MCLs, and wells with nondetectable concentrations of VOCs may be removed from the sampling program.

RATIONALE FOR NUMBER OF SAMPLES

Groundwater samples will be collected quarterly and annually, to monitor water quality. During the quarterly sampling events, 41 field groundwater samples will be collected, and 87 field groundwater samples will be collected during annual sampling events.

In addition to field groundwater samples mentioned above, field QA samples will be collected in the form of field duplicates, field blanks, and lab QC double volume samples. The purpose of the field QA samples is explained in the following paragraphs. The type of field QA samples to be collected are identified by well location and sampling day for quarterly events and annual events in Tables 5-2 and 5-3, respectively.

At a minimum, one field duplicate sample will be collected for each analysis for every 10 wells sampled. The field duplicate will be collected to check the precision of the field and laboratory procedures. A total of 5 field duplicates from 41 wells will be collected for all analytes under investigation during each quarterly sampling event. A total of 9 field duplicates from 87 wells will be collected for all analytes under investigation during the annual sampling event.

Field blank samples will be collected to check for the possible cross contamination of groundwater samples from the point of sample collection to the analysis of the samples by the laboratory. One field blank sample will be collected for all analytes in the field at the first sampling location each day. A total of approximately eight field blank samples (eight sampling days) will be collected during each quarterly sampling event. A total of approximately 16 field blank samples (16 sampling days) will be collected during the annual sampling event.

Lab QC double volume samples will be collected for all analyses during both quarterly and annual events. One lab QC double volume sample will be collected for every 20 samples collected. A total of three lab QC double volume samples will be collected during each quarterly sampling event. A total of five lab QC double volume samples will be collected during each annual sampling event.

With the inclusion of field quality assurance samples, 57 and 118 water samples will be collected during quarterly and annual sampling counts, respectively. The following is a summary of the number of samples that will be submitted to the CLP for laboratory analyses.

Quarterly Sampling Events

41	Field groundwater samples
5	Duplicate samples
8	Field blanks
3	Double volume lab QC samples
57	Quarterly Event Total

Annual Sampling Event

87	Field groundwater samples
9	Duplicate samples
17	Field blanks
5	Double-volume lab QC samples
118	Annual Event Total

SELECTION OF ANALYTICAL PARAMETERS

The selection of analytical parameters for groundwater is based on land use and existing groundwater data. VOCs, metals, and nitrates have been detected above MCLs in the groundwater at the SFVB site. Land use in the area includes or has included industry and manufacturing. The potential exists for contamination from chlorinated solvents, fuels, paint solvents, and metals. Several other parameters will be tested for evaluating treatment alternatives. These include chloride, sulfate, fluoride, alkalinity, bicarbonate, carbonate, TDS, TOC, and hardness. Analysis for N-nitrate/nitrite, radon, and gross alpha and beta radioactivity will be performed to assess what degree of blending may be needed to lower the concentration of nitrates and radionuclides to below MCLs such that groundwater from the basin can be delivered as drinking water after VOCs have been removed.

The analytical parameters during quarterly sampling events will consist of VOCs and N-nitrate/nitrite. A lower detection limit will be required for the analysis of samples for VOCs using CLP protocols. A detection limit lower than that described in the CLP statement of work is required since the action levels associated with many of the VOCs in California are lower than the detection limits associated with CLP protocols. Table 4-3 lists the California and Federal Action Levels for the parameters being analyzed. Quarterly information on N-nitrate/nitrite will establish background levels and groundwater treatment objectives.

The analytical parameters during the annual sampling event will consist of VOCs, semivolatiles, metals, radon, gross alpha and beta radioactivity, and the general chemistry water treatment analyses described earlier. The analytical parameters selected will be reviewed periodically and may be modified based on the results obtained from these chemical analyses.

Table 4-3
EPA and California Primary Maximum Contaminant Levels and California State Action Levels for Selected Organic Compounds, Metals, and Inorganic Compounds in Drinking Water (July 1990)

Constituent	Environmental Protection Agency		California Department of Health Services		
	Current MCL	Proposed MCL	Current MCL	Proposed MCL	Action Level (SAL)
VOLATILE ORGANICS (µg/l)					
Benzene	5.0	--	1.0	--	--
Carbon tetrachloride	5.0	--	0.5	--	--
Chlorobenzene	--	100	30	--	--
1,1-Dichloroethane	--	--	5.0	--	5.0
1,2-Dichloroethane	5.0	--	0.5	--	--
1,1-Dichloroethene	7.0	--	6.0	--	--
cis-1,2-Dichloroethene	--	70	6.0	--	6.0
trans-1,2-Dichloroethene	--	100	10.0	--	10
1,3-Dichloropropene	--	--	0.5	--	--
Methylene chloride	--	5	--	--	40
1,1,2,2-Tetrachloroethane	--	--	1.0	--	--
Perchloroethene	--	5.0	5.0	--	--
Total THMs	100	--	100	--	--
Toluene	--	2.000	--	--	100
1,1,1-Trichloroethane	200	--	200	--	--
1,1,2-Trichloroethane	--	5	32	--	--
Trichloroethene	5.0	--	5.0	--	--
SEMIVOLATILE ORGANICS (µg/l)					
1,3-Dichlorobenzene	--	--	--	--	130
1,4-Dichlorobenzene	75	--	5.0	--	--
Pentachlorophenol	--	200	--	--	30
METALS (mg/l)					
Aluminum					
Antimony	--	0.01/0.005[a]	--	--	--
Arsenic	0.05	--	0.05	--	--
Beryllium	--	0.001	--	--	--
Cadmium	0.01	0.005	0.01	--	--
Chromium	0.05	0.1	0.05	--	--

Table 4-3
EPA and California Primary Maximum Contaminant Levels and California State Action Levels for Selected Organic Compounds, Metals, and Inorganic Compounds in Drinking Water (July 1990)

Constituent	Environmental Protection Agency		California Department of Health Services		
	Current MCL	Proposed MCL	Current MCL	Proposed MCL	Action Level (SAL)
Copper[b]	1.0	1.3	1.0	--	--
Lead[c]	0.05	0.005/0.01	0.05	--	--
Mercury	0.002	0.002	0.002	--	--
Nickel	--	0.1	--	--	--
Selenium	0.01	0.05	0.01	--	--
Zinc[b]	5	--	5	--	--
INORGANICS (mg/l)					
Nitrate (as NO_3)	45	--	45	--	--

[a]Two options proposed July 25, 1990.
[b]Secondary standard.
[c]Lead proposed MCL: 0.005 mg/l at the source; ≤0.01 mg/l at the tap.

Note: -- Indicates no MCL or state action level has been promulgated or proposed, or the action level has been superseded by a current state MCL.

Section 5
REQUEST FOR ANALYSES

INTRODUCTION

This section presents information necessary to obtain laboratory space through the Contract Laboratory Program (CLP). Described are the analytical parameters and analytical methods to be used, the number of samples to be collected, estimated sampling dates, anticipated sample concentrations, sample containers, methods of preservation, and analytical holding times.

QUARTERLY AND ANNUAL SAMPLING EVENTS

GROUNDWATER SAMPLES

Over the course of each calendar year, four groundwater sampling events will be completed as part of the Basinwide monitoring program: three quarterly sampling events and one annual sampling event. Quarterly sampling events are scheduled to begin during the last weeks of January, July, and October of each year and are anticipated to last for approximately 10 consecutive days. Annual sampling events are scheduled for the last week of April of each year and are anticipated to last approximately 24 consecutive days. The annual sampling event will be composed of two 10-day work shifts with a 4-day break between work shifts.

The analyses requested for the groundwater samples collected during quarterly and annual sampling events differ somewhat based on the data needs of the project. Table 5-1 summarizes the analytical parameters, methods, and requested detection limits for the analyses requested for the Basinwide monitoring program. The analytical and quality control information for parameters not covered under the CLP statements of work for organics or inorganics have been extracted from the Region IX Special Analytical Services (SAS) Compendium and are found in Appendix C. The following is a summary of the requested analyses for quarterly and annual sampling events:

- **Quarterly Sampling Events**

  -- Routine Analytical Services (RAS) plus SAS analyses are requested for the analysis of groundwater samples for VOCs using CLP protocols that have been modified to attain detection limits less than 1 µg/l.

  -- SAS procedures are requested for the analysis of groundwater samples for nitrogen as nitrate/nitrite.

Table 5-1
Groundwater Samples, Analytical Parameters, Methods, and Detection Limits

Parameter	Method	Target Detection Limit[a]
TCL Volatiles	CLP[b]/SAS[c]	CLP[b]/SAS[c]
TCL Semivolatiles	CLP[b]	CLP[b]
TAL Metals	CLP[b]	CLP[b]
Chloride	300.0[d,e] or 325.3[d,e]	5 mg/l
Sulfate	300.0, 375.4[d,c] or 375.2[d,e]	5 mg/l
Bicarbonate	403[g]	2.20 mg/l
Carbonate	403[g]	2.20 mg/l
Nitrate+Nitrite	300.0[d,e], 353.2[d,e], or 353.3[d,e]	0.1 mg/l
Fluoride	340.2[d,e], or 340.3[d,e], or 340.1[d,e]	0.1 mg/l
Hardness	130.2[d,e]	5 mg/$CaCO_3$/l
Total Dissolved Solids	160.1[d,e]	3 mg/l
Total Organic Carbon	415.1[d,e]	2 mg/l
Radon	EPA 600/2-87-082[f]	100 piC/l
Gross Alpha/Beta Radio-activity	EPA 900.0	

[a]These are target values; actual limits depend on nature of the specific matrix and will be reported.
[b]CLP procedures and QC control limits are defined in EPA contracts 1FBs WA.85.J664/J680 and WP-85-J838/J839 or in the latest EPA contracts.
[c]Lower detection limits than CLP limits to be requested. Carbon tetrachloride at 0.5 ppb; others at 1 or 2 ppb detection limit as specified in Appendix A.
[d]Procedure given in Appendix A; methods listed in order of preference.
[e]EPA. 1979. *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983.
[f]EPA. September 1987. EPA/600/2-87-082. Appendix B: The Determination of Radon in Drinking Water by Liquid Scintillation, p. 22. Appendix D: Analytical Test Procedure, Radon/Water Concentration Analysis of Grab Samples Using Lucas Scintillation Cell Detection, p. 27.
[g]American Public Health Association. 1985. *Standard Methods for the Examination of Water and Wastewater.* 16th Edition.

- **Annual Sampling Events**

  -- RAS plus SAS procedures are requested for the analysis of groundwater samples for VOCs using CLP protocols capable of attaining detection limits less than 1 µg/l.

-- RAS procedures are requested for the analysis of groundwater samples for semivolatiles and metals.

-- SAS procedures are requested for the analysis of groundwater samples for inorganic treatment parameters including nitrate/nitrite, chloride, sulfate, bicarbonate, carbonate, fluoride, hardness, total dissolved solids, and total organic carbon.

-- SAS procedures are requested for the analysis of groundwater samples for radionuclides including radon, gross alpha, and gross beta.

During quarterly sampling events, approximately 57 water samples including field quality assurance samples will be collected for RAS plus SAS analyses for VOCs, and SAS analyses for nitrogen as nitrate/nitrite.

During annual sampling events, approximately 118 water samples including field quality assurance samples will be collected as follows:

- 118 RAS semivolatile analyses, does not include trip blanks
- 118 RAS metals analyses, does not include trip blanks or double volume lab QC samples
- 118 RAS plus SAS VOC analyses, includes all required field QA samples
- 118 SAS inorganic treatment parameter analyses, does not include trip blanks
- 118 SAS radon analyses, does not include trip blanks and double volume lab QC samples
- 118 SAS gross alpha and gross beta analyses, does not include trip blanks and double volume lab QC samples

Tables 5-2 and 5-3 summarize all of the groundwater samples and field quality assurance samples that will be collected during quarterly and annual sampling events, respectively.

Table 5-2
Request for Analysis--Quarterly Sampling Events
(matrix = water)

CLP Analysis Requested:				**RAS and SAS**	**SAS**	
Specific Analysis Requested:				**VOCs**	**Nitrate + Nitrite**	
Preservatives:				**Add two drops 1:1 HCl; chill to 4°C**	**Cool, 4°C, H_2SO_4 to pH <2**	
Analytical Holding Time:				**Hold <14 days**	**Hold <28 days**	
Contract Holding Time:				**Hold <10 days**	**Hold to <25 days**	
Sample Location	**Sample Schedule (sample day)**	**Field QA Sample**	**Concentration**	**(No. bottles/analysis) (3x40-ml glass vial)**	**(No. bottles/analysis) (1x250 ml) polyethylene bottle)**	**No. Containers per Well**
NH-C01-325	1	B	Low	2	2	8
NH-VPB-07	1	D	Low	2	2	8
NH-C03-580	1		Low	1	1	4
NH-VPB-09	1		Low	1	1	4
NH-VPB-06	1		Low	1	1	4
Subtotal				**7**	**7**	**28**
NH-VPB-08	2	B	Low	2	2	8
NH-VPB-05	2		Low	1	1	4
NH-C02-325	2	L	Low	2	2	8
NH-C02-220	2		Low	1	1	4
NH-C06-160	2		Low	1	1	4
Subtotal				**7**	**7**	**28**
NH-VPB-14	3	B,D	Low	3	3	12
NH-C04-240	3		Low	1	1	4
NH-VPB-01	3		Low	1	1	4
CS-C01-105	3		Low	1	1	4
CS-C01-285	3		Low	1	1	4
Subtotal				**7**	**7**	**28**
CS-C02-62	4	L,B	Low	3	3	12
CS-C02-180	4		Low	1	1	4
CS-C02-250	4		Low	1	1	4
CS-C02-335	4		Low	1	1	4
CS-VPB-02	4		Low	1	1	4
Subtotal				**7**	**7**	**28**
CS-VPB-01	5	B	Low	2	2	8
CS-VPB-08	5		Low	1	1	4
CS-VPB-05	5	D	Low	2	2	8

Table 5-2
Request for Analysis--Quarterly Sampling Events
(matrix = water)

CLP Analysis Requested:				**RAS and SAS**	**SAS**	
Specific Analysis Requested:				**VOCs**	**Nitrate + Nitrite**	
Preservatives:				**Add two drops 1:1 HCl; chill to 4°C**	**Cool, 4°C, H_2SO_4 to pH <2**	
Analytical Holding Time:				**Hold <14 days**	**Hold <28 days**	
Contract Holding Time:				**Hold <10 days**	**Hold to <25 days**	
Sample Location	**Sample Schedule (sample day)**	**Field QA Sample**	**Concentration**	**(No. bottles/analysis) (3x40-ml glass vial)**	**(No. bottles/analysis) (1x250 ml) polyethylene bottle)**	**No. Containers per Well**
CS-C05-160	5		Low	1	1	4
CS-C05-290	5		Low	1	1	4
Subtotal				**7**	**7**	**28**
CS-VPB-07	6	D, B	Low	3	3	12
CS-C03-100	6		Low	1	1	4
CS-VPB-04	6		Low	1	1	4
CS-C04-290	6		Low	1	1	4
CS-C04-382	6		Low	1	1	4
Subtotal				**7**	**7**	**28**
CS-VPB-11	7	B	Low	2	2	8
CS-VPB-06	7		Low	1	1	4
CS-VPB-10	7		Low	1	1	4
PO-VPB-02	7	D	Low	2	2	8
PO-C02-53	7		Low	1	1	4
PO-VPB-01	7		Low	1	1	4
Subtotal				**8**	**8**	**32**
PO-VPB-03	8	B	Low	2	2	8
PO-C03-182	8		Low	1	1	4
PO-VPB-07	8	L	Low	2	2	8
PO-VPB-04	8		Low	1	1	4
PO-VPB-08	8		Low	1	1	4
Subtotal				**7**	**7**	**28**
Total				**57**	**57**	**228**

B = Field blank sample: taken at the first sample location every day for all parameters.
D = Field duplicate sample: taken once every 10 samples for all parameters.
L = Laboratory QC sample: taken once every 20 total samples (including blanks and duplicates) for all parameters.

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
NH-VPB-13	1	B	Low	2	2	2	2			2	2	2	2	24
NH-VPB-11	1		Low	1	1	1	1			1	1	1	1	12
NH-C05-320	1		Low	1	1	1	1			1	1	1	1	12
NH-C05-460	1		Low	1	1	1	1			1	1	1	1	12
NH-VPB-06	1		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				6	6	6	6			6	6	6	6	72
NH-VPB-09	2	B	Low	2	2	2	2			2	2	2	2	24
NH-VPB-10	2		Low	1	1	1	1			1	1	1	1	12
NH-C01-325	2	D	Low	2	2	2	2			2	2	2	2	24
NH-C01-450	2		Low	1	1	1	1			1	1	1	1	12
NH-C01-660	2		Low	1	1	1	1			1	1	1	1	12
NH-C01-780	2		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				8	8	8	8			8	8	8	8	96

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
NH-VPB-07	3	B	Low	2	2	2	2			2	2	2	2	24
NH-VPB-02	3		Low	1	1	1	1			1	1	1	1	12
NH-C03-380	3		Low	1	1	1	1			1	1	1	1	12
NH-C03-580	3		Low	1	1	1	1			1	1	1	1	12
NH-C03-680	3		Low	1	1	1	1			1	1	1	1	12
NH-C03-800	3		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84
NH-VPB-08	4	B	Low	2	2	2	2			2	2	2	2	24
NH-VPB-05	4		Low	1	1	1	1			1	1	1	1	12
NH-C02-220	4		Low	1	1	1	1			1	1	1	1	12
NH-C02-325	4	L	Low	2	2	2	2			2	2	2	2	24
NH-C02-520	4		Low	1	1	1	1			1	2	2	1	12
NH-C02-681	4		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				8	8	8	8			8	8	8	8	96

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
NH-VPB-03	5	B	Low	2	2	2	2			2	2	2	2	24
NH-VPB-04	5		Low	1	1	1	1			1	1	1	1	12
NH-C06-160	5		Low	1	1	1	1			1	1	1	1	12
NH-C06-285	5		Low	1	1	1	1			1	1	1	1	12
NH-C06-425	5		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				6	6	6	6			6	6	6	6	72
NH-VPB-12	6	B	Low	2	2	2	2			2	2	2	2	24
NH-VPB-14	6	D	Low	2	2	2	2			2	2	2	2	24
NH-C04-240	6		Low	1	1	1	1			1	1	1	1	12
NH-C04-375	6		Low	1	1	1	1			1	1	1	1	12
NH-C04-560	6		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
NH-VPB-01	7	B,D	Low	3	3	3	3			3	3	3	3	36
CS-C01-105	7	L	Low	2	2	2	2			2	2	2	2	24
CS-C01-285	7	D	Low	2	2	2	2			2	2	2	2	24
CS-C01-558	7		Low	1	1	1	1			1	1	1	1	12
CS-VPB-02	7		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				9	9	9	9			9	9	9	9	108
CS-VPB-01	8	B	Low	2	2	2	2			2	2	2	2	24
CS-C02-62	8	D	Low	2	2	2	2			2	2	2	2	24
CS-C02-180	8		Low	1	1	1	1			1	1	1	1	12
CS-C02-250	8		Low	1	1	1	1			1	1	1	1	12
CS-C02-335	8		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit–VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
CS-VPB-03	9	B	Low	2	2	2	2			2	2	2	2	24
CS-VPB-08	9	L	Low	2	2	2	2			2	2	2	2	24
CS-VPB-05	9	D	Low	2	2	2	2			2	2	2	2	24
CS-C05-160	9		Low	1	1	1	1			1	1	1	1	12
CS-C05-290	9		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				8	8	8	8			8	8	8	8	96
CS-VPB-07	10	B	Low	2	2	2	2			2	2	2	2	24
CS-C03-100	10	D	Low	2	2	2	2			2	2	2	2	24
CS-C03-325	10		Low	1	1	1	1			1	1	1	1	12
CS-C03-465	10		Low	1	1	1	1			1	1	1	1	12
CS-C03-550	10		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
CS-C04-290	11	B	Low	2	2	2	2			2	2	2	2	24
CS-C04-382	11		Low	1	1	1	1			1	1	1	1	12
CS-C04-520	11		Low	1	1	1	1			1	1	1	1	12
CS-VPB-04	11	D	Low	2	2	2	2			2	2	2	2	24
CS-VPB-09	11		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84
CS-VPB-11	12	B	Low	2	2	2	2			2	2	2	2	24
CS-VPB-10	12		Low	1	1	1	1			1	1	1	1	12
CS-VPB-06	12	L	Low	2	2	2	2			2	2	2	2	24
CS-C06-185	12		Low	1	1	1	1			1	1	1	1	12
CS-C06-278	12		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
VD-VPB-06	13	B	Low	2	2	2	2			2	2	2	2	24
VD-VPB-07	13		Low	1	1	1	1			1	1	1	1	12
VD-VPB-01	13		Low	1	1	1	1			1	1	1	1	12
VD-VPB-05	13		Low	1	1	1	1			1	1	1	1	12
VD-VPB-02	13		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				6	6	6	6			6	6	6	6	72
VD-VPB-04	14	B	Low	2	2	2	2			2	2	2	2	24
VD-VPB-03	14		Low	1	1	1	1			1	1	1	1	12
PO-VPB-11	14		Low	1	1	1	1			1	1	1	1	12
PO-VPB-07	14		Low	1	1	1	1			1	1	1	1	12
PO-VPB-10	14		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				6	6	6	6			6	6	6	6	72

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/ analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/ analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/ analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/ analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
PO-VPB-02	15	B, D	Low	3	3	3	3			3	3	3	3	36
PO-C01-195	15		Low	1	1	1	1			1	1	1	1	12
PO-C01-354	15		Low	1	1	1	1			1	1	1	1	12
PO-C02-53	15		Low	1	1	1	1			1	1	1	1	12
PO-C02-205	15		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84
PO-VPB-01	16	B	Low	2	1	2	2			2	2	2	2	24
PO-VPB-03	16	L	Low	2	2	2	2			2	2	2	2	24
PO-C03-182	16		Low	1	1	1	1			1	1	1	1	12
PO-C03-235	16		Low	1	1	1	1			1	1	1	1	12
PO-VPB-05	16		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				7	7	7	7			7	7	7	7	84

Table 5-3
Request for Analysis
Annual Sampling Event
(matrix = water)

CLP Analysis Requested:				RAS		RAS + SAS	SAS							
Specific Analysis Requested:				Semivolatiles	Metals	Low Detection Limit--VOCs	Chloride, Sulfate, Fluoride	Alkalinity, Bicarbonate, Carbonate	Total Dissolved Solids	Total Organic Carbon[a] Nitrate + Nitrite	Hardness	Radon	Gross Alpha and Beta Radioactivity	
Preservatives:				Chill to 4°C	Filter, chill to 4°C, add HNO_3 to pH <2	Add two drops 1:1 HCl; chill to 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C	Cool, 4°C, H_2SO_4 to pH <2	Cool, 4°C, HNO_3 to pH <2	See appended procedure	Cool 4°C, HNO_3 to pH <2	
Analytical Holding Time:				Hold <7 days prior to extraction; 40 days after extraction	Hold to <6 months (28 days for mercury)	Hold <14 days	Hold <28 days	Hold <14 days	Hold <7 days	Hold <28 days	Hold <6 months	Hold <2 days	Hold <6 months	
Contract Holding Time:				Hold <5 days prior to extraction; 40 days after extraction	Hold to <6 months (26 days for mercury)	Hold <10 days	Hold <25 days	Hold <12 days	Hold <5 days	Hold <25 days	Hold <6 months	Immediate analysis		
Sample Location	Sample Schedule (sample day)	Field QA Sample	Concentration	(No. bottles/analysis) (2x1-liter amber glass)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	(No. bottles/analysis) (3x40-ml glass vial)	(No. bottles/analysis) (1x1-liter polyethylene bottle)			(No. bottles/analysis) (500-ml polyethylene bottle)	(No. bottles/analysis) (250-ml polyethylene bottle)	(No. bottles/analysis) (2x20-ml vials, prefilled with scintillation mix)	(No. bottles/analysis) (1x1-liter polyethylene bottle)	No. Containers per Well
PO-VPB-04	17	B	Low	2	2	2	2			2	2	2	2	24
PO-VPB-09	17		Low	1	1	1	1			1	1	1	1	12
PO-VPB-06	17		Low	1	1	1	1			1	1	1	1	12
PO-VPB-08	17		Low	1	1	1	1			1	1	1	1	12
Daily Subtotal				5	5	5	5			5	5	5	5	60
Total				118	118	118	118			118	118	118	118	1,416

[a]TOC = Total organic carbon (no head space).
T = Field blank sample: Taken at the first sample location every day for all parameters.
D = Field duplicate sample: Taken once every 10 samples for all parameters.
L = Laboratory QC sample: Taken once every 20 samples for all parameters.

Section 6
METHODS AND PROCEDURES

The procedures for collecting groundwater and potentially hazardous investigation-derived solid waste samples are described in this section. The onsite hydrogeologist or engineer has the authority to modify the following procedures, depending on the particular situation and how, in the individual's best judgment, the most representative sample can be taken. However, any deviations from the procedures outlined in this document will be recorded in the Sample Collection Log. An explanation of when and why these procedures were not followed and what procedures were followed will also be entered.

GROUNDWATER SAMPLING

The following general sampling procedures will be used for the monitoring wells.

1. The static water level will be determined.

2. Based on the static water level and well construction details, the volume of water in the well casing and gravel pack will be determined. Estimated purge volumes are found in Table 6-1.

   The volume of water required to be purged from the well is calculated from the following formula:

   $$V = 7.48 \times 5 \, (\pi r^2 h + n(\pi R^2 h - \pi r^2 h))$$

   Where:

   V = Volume to be pumped (in gallons)

   h = Saturated thickness of groundwater in the well, or the depth of well minus the depth to water (feet)

   r = Radius of the well (feet)

   R = Radius of the borehole (feet)

   n = Porosity

Table 6-1 Monitoring Well Purge Volumes						
				During Sampling Events		
Well Site	Well Name	Total Depth of Well (a) (ft bgs) (b)	Depth of Water (a,c) (ft bgs) (b)	Minimum Purge Volume (d,c) (gallons)	Maximum Purge Volume (d,c) (gallons)	Sampling Frequency (Q or A)
CRYSTAL SPRINGS WELLS						
CS-C01	CS-C01-105	107	93.6	86	144	Q
	CS-C01-285	287	93	440	733	Q
	CS-C01-558	563	97.9	971	1619	A
CS-C02	CS-C02-62	62	39.6	104	173	Q
	CS-C02-180	180	39.8	335	558	Q
	CS-C02-250	250	39.9	472	786	Q
	CS-C02-335	335	40.4	637	1062	Q
CS-C03	CS-C03-100	100	54.6	149	248	Q
	CS-C03-325	325	56.2	587	978	A
	CS-C03-465	465	56.7	860	1433	A
	CS-C03-550	550	56.6	1027	1711	A
CS-C04	CS-C04-290	290	49.4	531	886	Q
	CS-C04-382	382	50.2	710	1183	Q
	CS-C04-520	520	50.2	980	1634	A
CS-C05	CS-C05-160	160	34	307	511	Q
	CS-C05-290	290	37	556	926	Q
CS-C06	CS-C06-185	185	36.8	350	584	A
	CS-C06-278	278	38.8	529	881	A
NORTH HOLLYWOOD WELLS						
NH-C01	NH-C01-325	330	298.6	122	203	Q
	NH-C01-450	453	298.7	362	604	A
	NH-C01-660	662	302.7	764	1273	A
	NH-C01-780	785	304.1	1002	1670	A
NH-C02	NH-C02-220	225	179.9	148	247	Q
	NH-C02-325	325	182.1	340	567	Q
	NH-C02-520	520	191.2	704	1174	A

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Table 6-1 Monitoring Well Purge Volumes						
				During Sampling Events		
Well Site	Well Name	Total Depth of Well (a) (ft bgs) (b)	Depth of Water (a,c) (ft bgs) (b)	Minimum Purge Volume (d,c) (gallons)	Maximum Purge Volume (d,c) (gallons)	Sampling Frequency (Q or A)
	NH-C02-681	686	191.6	1029	1714	A
NH-C03	NH-C03-380	380	246.8	321	535	A
	NH-C03-580	580	235	736	1227	Q
	NH-C03-680	680	234.7	932	1554	A
	NH-C03-800	800	249.9	1138	1896	A
NH-C04	NH-C04-240	240	94	346	577	Q
	NH-C04-375	375	114.6	570	950	A
	NH-C04-560	565	86.2	998	1664	A
NH-C05	NH-C05-320	320	308.6	82	137	A
	NH-C05-460	460	307.7	358	597	A
NH-C06	NH-C06-160	162	120.5	141	236	Q
	NH-C06-285	290	125.8	382	636	A
	NH-C06-425	430	131.3	645	1075	A
POLLOCK WELLS						
PO-C01	PO-C01-195	197	41.8	364	607	A
	PO-C01-354	359	40.9	683	1139	A
PO-C02	PO-C02-53	57	43.6	86	144	Q
	PO-C02-205	210	43.8	386	643	A
PO-C03	PO-C03-182	185	43.8	337	561	Q
	PO-C03-235	240	44	444	740	A
VERDUGO VPB's						
	VD-VPB-01	210	202.6	74	124	A
	VD-VPB-02	136	124	84	139	A
	VD-VPB-03	45	21.1	107	178	A
	VD-VPB-04	116	89.1	113	188	A
	VD-VPB-05	156	143.8	84	140	A
	VD-VPB-06	96	76.4	98	164	A

Table 6-1 Monitoring Well Purge Volumes						
				During Sampling Events		
Well Site	Well Name	Total Depth of Well (a) (ft bgs) (b)	Depth of Water (a,c) (ft bgs) (b)	Minimum Purge Volume (d,c) (gallons)	Maximum Purge Volume (d,c) (gallons)	Sampling Frequency (Q or A)
	VD-VPB-07	216	202.5	86	144	A
NORTH HOLLYWOOD VPB's						
	NH-VPB-01	169	103.9	188	313	Q
	NH-VPB-02	264	231	125	208	A
	NH-VPB-03	223	125.4	251	419	A
	NH-VPB-04	188	154.7	125	209	A
	NH-VPB-05	207	180.7	112	186	Q
	NH-VPB-06	310	259.2	160	266	Q
	NH-VPB-07	295	269.6	110	183	Q
	NH-VPB-08	231	195.3	130	217	Q
	NH-VPB-09	293	275.1	95	158	Q
	NH-VPB-10	328	238.3	236	393	A
	NH-VPB-11	329	293.6	129	216	A
	NH-VPB-12	171	134.6	131	219	A
	NH-VPB-13	379	352.2	113	188	A
	NH-VPB-14	111	93.3	95	158	Q
POLLOCK VPB's						
	PO-VPB-01	65	27.2	134	223	Q
	PO-VPB-02	71	39.9	121	202	Q
	PO-VPB-03	71	37.2	126	210	Q
	PO-VPB-04	119	30	234	391	Q
	PO-VPB-05	69	31.6	133	222	A
	PO-VPB-06	55	23.9	121	202	A
	PO-VPB-07	93	55.5	133	222	Q
	PO-VPB-08	49	19.8	117	195	Q
	PO-VPB-09	58	21.6	131	219	A
	PO-VPB-10	93	62.9	119	198	A

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Table 6-1
Monitoring Well Purge Volumes

Well Site	Well Name	Total Depth of Well (a) (ft bgs) (b)	Depth of Water (a,c) (ft bgs) (b)	During Sampling Events: Minimum Purge Volume (d,c) (gallons)	During Sampling Events: Maximum Purge Volume (d,c) (gallons)	Sampling Frequency (Q or A)
	PO-VPB-11	110	40.2	197	328	A
CRYSTAL SPRINGS VPB's						
	CS-VPB-01	109	56.8	162	270	Q
	CS-VPB-02	100	67.4	124	206	Q
	CS-VPB-03	100	60.6	137	229	A
	CS-VPB-04	81	45	131	218	Q
	CS-VPB-05	61	30	121	201	Q
	CS-VPB-06	76	37.3	136	226	Q
	CS-VPB-07	436	57.2	802	1337	Q
	CS-VPB-08	435	47.6	819	1365	Q
	CS-VPB-09	80	54.7	110	183	A
	CS-VPB-10	104	62.8	141	235	Q
	CS-VPB-11	121	81.9	137	228	Q
TOTAL				30,083	50,140	

Notes:

a) Total depth of well and screen depth from May 1991 Quarterly Sampling Plan, J.M. Montgomery Inc.
b) bgs = below ground surface.
c) Depth to Water = lowest point during Dec. 1990 through June 1991, except for wells designated with " * " which are July 1990 (J.M. Montgomery, Inc.).
d) Initial purge volume = (Total depth of well - depth to water) x Area of 4-inch diameter casing + 0.3 of gravel pack volume in average of 20-foot screened interval.
e) Minimum purge volume = 3 x (Initial purge volume) and Maximum purge volume = 5 x (Initial purge volume).

It was assumed that the porosity of the gravel pack is approximately 30 percent and 5 well volumes are to be pumped. If the aquifer being sampled has a low permeability and the well is readily pumped dry, the well will be pumped dry three times and the well sampled after it recovers.

3. The well will be pumped until three to five well volumes are removed and the pH, temperature, and electrical conductivity of the discharge water have stabilized to within 10 percent between successive well volumes. The well will be sampled without stabilization if stabilization is not reached within 30 minutes after 5 well volumes are removed. Well discharge rate will also be measured intermittently as described in this section.

4. Samples will be collected in the appropriate containers (described in Tables 5-2 and 5-3). Samples will be collected from a valve near the wellhead. If required, the sample will be filtered, the proper preservatives added to the sample container, and the sample tested for pH.

5. The following general procedures apply to all samples:

   - After purging the well, the outlet valve will be closed sufficiently to only allow 0.5 to 1 gpm of flow.

   - The mixing of air with the groundwater sample will be minimized by tilting the bottle and allowing the water to run down the inside wall of the bottle. A gentle stream of water should enter the bottle.

   - Sample bottles will be kept out of the sun and kept cool prior to sampling. The filled sample bottles will be packaged and placed directly into a cooler with Blue Ice. The Blue Ice packages will be in sealable plastic bags.

   - Plastic bottles without preservatives will be filled completely full to minimize air contact. One-half-liter amber glass bottles will be filled only 7/8 full to allow room for expansion of liquid.

   - When checking the pH of a sample for preservation, the pH probe or pH paper will not be inserted into the sample bottle, as it may contaminate the sample. A small amount of the sample will be poured into a small beaker, and that portion will be tested with the pH probe.

   - If a container other than the sample container is used to extract the sample, a specially cleaned disposable container will be used. The disposable containers will be made of nalgene, stainless steel, or Teflon.

- Precautions will be taken to limit the contamination of samples from outside sources. Hands will be washed with distilled water, and disposal surgical gloves will be used.

- The well number or sample location, analytical parameter, preservatives added, name of sampler, and date and time of sampling will be written directly on the bottle label with a waterproof pen.

6. Relevant information will be recorded in the field notebook and in the Sample Collection Log.

Specific procedures are required for some samples and are discussed in the following paragraphs.

When sampling for VOCs, the 40-ml sample vials will have no headspace. The vial will be filled so that no headspace is present to eliminate any air bubbles, and the Teflon-lined cap will be replaced. Three vials will be collected for each sample. The vial will be turned upside-down and tapped to check for air bubbles. If there are any bubbles, the vial will be discarded and another vial will be filled. This procedure will be repeated until an acceptable sample is obtained.

Samples requiring filtration will be filtered through a 0.45-micron millipore disposable in-line filter in the field. A separate disposable filter will be used for each well. Sampling procedures for collecting samples for radon analyses will be as described in Appendix C (in its Appendix B, pages 22 and 23).

FIELD MEASUREMENTS

Water levels will be measured with an electric sounder. There is a 1-inch PVC sounding tube at 73 of the 87 monitoring wells. Measurements will be recorded to the nearest 0.01 foot from the top of the conductor casing. The sounder will be battery-operated and have marks on the sounder line at regular intervals (every 5, 10, or 20 feet). All water levels will be measured with the same sounder. The sounder will be accompanied by a calibration log book which will be used to record the following:

- Date and time of last calibration and name of calibrator

- The point of calibration (either the center of a mark on the sounding line or the extreme of the first mark nearest the probe)

Electrical conductivity, temperature, and pH measurements will be made prior to and during the collection of each groundwater sample using methods recommended by the equipment manufacturer. A conventional pH meter with a combination

gel-filled electrode or equivalent will be used for field pH determinations. A combination electrical conductivity-temperature-salinity meter or equivalent measuring devices will be used for determination of conductivity and temperature. All instruments will be periodically calibrated (according to manufacturer specifications) to maintain accuracy.

The measurements will be made as follows:

- The transfer bottle (a nalgene bottle used solely for this purpose) will be rinsed with sample water prior to filling.
- Instrument probes will be thoroughly rinsed with distilled water, then immediately submerged in the transfer bottle, and measurements will be taken.
- All field measurements will be recorded in a field notebook along with the sample location and time and date of measurement.
- After measurements are recorded, the transfer bottle and the probes will be decontaminated by rinsing with distilled water. If the transfer bottle cannot be cleaned, a new bottle will be used.

Discharge measurements for monitoring wells (flow approximately 4 to 15 gpm) will be made with a calibrated bucket and stopwatch.

TRANSPORT AND DISPOSAL OF DERIVED WASTES

Transport and disposal of potentially hazardous waste will occur during four events --three quarterly sampling events of 41 monitoring wells and one annual sampling event for 87 monitoring wells. Purged well water and potentially hazardous solid wastes will be transported from the monitoring well sites to the LADWP North Hollywood Aeration Facility (NHAF) by a hazardous waste transport and disposal subcontractor. Purged well water will be pumped directly into a 55-gallon drum prior to transfer into the subcontractor's vacuum truck. Groundwater from several wells may be mixed in the vacuum truck during the course of a day's work. The water will then be transferred from the vacuum truck into temporary storage Baker tanks at the NHAF on a daily basis. The water will be characterized and treated in accordance with DHS requirements and disposed of by LADWP.

All protective clothing, field sampling gear, and other miscellaneous items will be collected in 3-mil plastic bags. The contents of each bag, including the plastic liner, will be transported to the NHAF (using U.S. Department of Transportation-approved 55-gallon drums) and contained in 10-cubic-yard rolloff bins. All

protective clothing and sampling waste will be disposed of at an appropriate waste disposal facility by the hazardous waste transport and disposal subcontractor.

It is anticipated that an area within the LADWP NHAF can be used for storage of the Baker tanks, rolloff boxes, and 55-gallon drums until their contents have been analyzed and the appropriate disposal method is decided upon.

EQUIPMENT DECONTAMINATION

Prior to the start of work, all equipment will be washed and cleaned as specified and approved by the site safety officer or field team leader prior to initiation of work at the site. This includes sampling equipment and any other equipment brought onsite. This is especially important to prevent cross-contamination between monitoring wells by any equipment being placed down the well.

For all sampling tools and any other equipment, the following decontamination procedures apply:

- The decontamination area will be covered with plastic liners.
- Sampling equipment, water level sounders, or any equipment placed down the bore of a well will be washed in nonphosphate detergent, rinsed with clean water (tap), rinsed with deionized water, then rinsed with isopropanol (pesticide grade), and finally rinsed with organic-free, deionized water. Rinsates will be containerized and transported to the NHAF by a hazardous waste hauling subcontractor.
- Water sampling, water level measuring, and sample preparation equipment that comes onsite will be cleaned prior to and after each use on this project. Decontamination will consist of combinations of steam cleaning and/or detergent (trisodium phosphate) wash, water rinse, alcohol (or other solvent) rinse, and repeated distilled water rinse.

All equipment that enters or leaves the onsite work area will be decontaminated as if exposed to Level C contaminants. Personnel who leave the onsite work area will be decontaminated as required in the Site Safety Plan (Appendix E). Abovegrade equipment on the onsite work area, all downhole equipment, holding tanks, and other equipment that could transfer contaminants from one well site to another will be decontaminated between well sites.

All decontamination operations will be conducted by subcontractor personnel wearing Level D protective equipment.

SAMPLE CONTAINERS AND PRESERVATION

The sample containers and preservatives will be as specified in Section 5, Request for Analysis, and Tables 5-2 and 5-3. Sample bottles for the groundwater sampling will be procured through the CLP bottle repository. The preservatives will be added in the field prior to sampling (except for metals, which will be added after filtering). Field holding time of samples will be limited to 24 hours.

SAMPLE PACKAGING AND SHIPPING

A sample number, consisting of a CLP sticker for RAS analyses or a SAS number with a sequential extension for SAS analyses, will be placed on all SAS sample containers. The following information will also be written on each sample container (both RAS+SAS and SAS) with a permanent marker, then covered with clear plastic tape.

- Sample location number (if a CLP sticker is used)
- Case number (if applicable)
- Type of analysis requested
- Preservative used
- Date collected

The lid of each container will be wrapped with electrical tape. Custody seals will then be placed over the cap of each sample container. However, custody seals on the VOA vials will be placed around the lid to prevent covering the Teflon septum.

VOA vials (two or three vials per sample) will be wrapped together securely in bubble pack and secured with tape. Sealed samples will be placed in sealable plastic bags labeled with the sample number. Each bubble-wrapped VOA vial pair or triplet will be placed in one sealable plastic bag. All other glass bottles will be bubble-wrapped and placed into sealable plastic bags. Polyethylene bottles will be placed into sealable plastic bags.

Water sample bottles are fragile and should be handled with care. The packaged samples will be placed in coolers with Blue Ice and vermiculite, No. 1 foam liner, or bubble wrap. The Blue Ice may be replaced with double sealable plastic bags filled with cubed ice. Samples should be packaged upright and protected from shipping damage. All appropriate sample documentation will be placed in sealable plastic bags and taped to the inside lid of the cooler. The cooler should be sealed with tape. In addition, tape should be placed over the latch and drain plug of the cooler. At lease two custody seals will be placed on different sides of the cooler in a manner such that they extend from the main body to the lid of the cooler. Clear tape will be placed over the seals to ensure that they are not broken accidently during shipment. Ice chests should be labeled with "Fragile" and "This End Up"

labels on all four sides. Coolers will be shipped to the appropriate CLP laboratory via overnight carrier (e.g., Federal Express Priority 1). All groundwater samples are expected to be low concentration (<10 ppm). Each day's sample shipment will be reported to the EPA Region IX RSCC. For Friday shipments, the Routine Sample Control Coordinator (RSCC) will be contacted prior to 12 noon to coordinate with the laboratories that will receive the sample shipments on Saturday. The laboratory must provide assurances that samples shipped on Fridays will be analyzed prior to exceeding analytical holding times.

SAMPLE DOCUMENTATION

The following sections describe the sampling documentation that will be used. All sampling activities will be recorded in bound, numbered field notebooks. Chain-of-custody procedures will be used to maintain and document sample possession. After sample packaging, the following EPA Region IX paperwork must be completed (Appendix D).

- Organic traffic reports for use when shipping RAS or RAS+SAS samples
- Inorganic traffic reports for use when shipping RAS or RAS+SAS samples
- SAS packing lists for use when shipping SAS samples
- Chain-of-custody records
- Air bills

Instructions for filling out EPA Region IX CLP paperwork and examples of completed forms are included in Appendix D. Completed field QA/QC summary forms will be sent to EPA QAMS at the conclusion of the sampling. Sample shipping information from each day will be relayed to the RSCC at EPA Region IX QAMS as soon as possible after shipping.

FIELD LOGS AND NOTEBOOK

Field data will be recorded on individual log sheets and in bound notebooks. A bound notebook will be maintained whenever samples are being taken.

Examples of the field logs are included in Appendix E. These logs include:

- Daily Field Log (Inspection Diary)
- Groundwater Quality Sampling Diary

- Sample Collection Log

These logs will be completed and dated by the individual directly supervising the work.

The Daily Field Log will be maintained by the onsite supervisor. This log will be used to document arrival and departure of visitors, weather, health and safety notes, decontamination procedures, and any other pertinent information essential to reconstruct the day's events. All information entered in this notebook will be recorded in ink.

The Groundwater Quality Sampling Diary will be maintained by the onsite supervisor. Members of the field team will use this notebook to record information taken during sampling. The information should include the name of the sampler, sample designation, date, time, location, field parameter and water level measurements, volume purged, sample containers used, decontamination procedure, and sampling procedure. All information entered in this notebook will be recorded in ink; will be sufficient to correlate the samples taken with information recorded on the Sample Collection Logs; and will provide sufficient information to trace and assess the quality of each sample if the sample collection logs are lost.

SAMPLE CUSTODY

A required part of any sampling and analytical program is maintaining the integrity of the sample from collection to data reporting. This includes the ability to trace the possession and handling of samples from the time of collection, through analysis, and final deposition. This documentation of the sample's history is referred to as "chain of custody." The components of the CLP chain-of-custody requirements (custody seals, a field logbook, chain-of-custody record, and sample labels), and the procedures for their use are described in the following sections. Sample custody procedures will follow EPA contract laboratory guidance and NEIC procedures (EPA, 1986).

A sample is considered to be under a person's custody if it is:

- In a person's physical possession or view
- Retained in a secured area with restricted access
- Placed in a container and secured so the samples(s) cannot be tampered with, i.e., under lock or under official seal

A person who has samples under custody must comply with the procedures described in the following sections.

CHAIN-OF-CUSTODY RECORD

To establish the documentation necessary to trace sample possession from the time of collection, a Chain-of-Custody Record(s) will be filled out and accompany every sample shipment. Instructions for completing a Chain-of-Custody Record are contained in Appendix D.

The record will contain the following minimum information:

- Sampling location (tied to a sampling location)
- Signature of collector(s)
- Date and time of collection
- Sample number
- Number of containers
- Project name and number
- Sample description
- Case number
- Special Analytical Services (SAS) number (when applicable)
- Name of shipper
- Date shipped
- Air bill number
- Signatures of people involved in the chain of possession

In order to maintain chain of custody, each person in custody of the sample will sign, date, and note time on the form, and samples will not be left unattended unless placed in a secure and sealed container (custody seals) with the Chain-of-Custody Record inside the container.

CUSTODY SEALS

Custody seals are used to detect unauthorized tampering of samples from sample collection to the time of analysis. Custody seals will be provided by the EPA Region IX RSCC. A sample of a custody seal is illustrated in Appendix D. The seal will be attached to the sample container and be of the type that must be broken to open the sample container. Seals will be affixed to each sample container before the samples leave the custody of the sampling personnel. Shipping containers will also contain seals to detect possible tampering. A seal will include the following information:

- Sample signature
- Date of collection

QUALITY ASSURANCE

Field duplicate samples will be collected to check the precision of field and laboratory procedures. They will be labeled and packaged in the same manner as other samples so that the lab cannot distinguish between samples and duplicates. Field duplicates will be collected by alternately filling sample and sample duplicate containers at a location of known or suspected contamination. Each duplicate will be taken using the same sampling and preservation method as other samples. The minimum number of field duplicates collected will be approximately 10 percent of the wells sampled.

Field blanks will be collected to check for possible cross contamination during sampling, shipment, and within the laboratory. The blank will be made with organic-free distilled-deionized water for organic analyses and reagent-grade deionized water for inorganic analyses using the same preservation methods and packaging and sealing procedures used during collection of groundwater samples. A field blank for each analysis will be collected each day. They will be labeled and packaged in the same manner as other samples so that the lab cannot distinguish between samples and duplicates.

One of every 20 samples collected (including duplicates and blanks) will be designated for lab quality control (QC). This sample will be twice the normal amount of sample collected and should be from a well with suspected contamination. The label "Lab QC Sample" will appear on the bottles and on the paperwork. The first lab QC sample will be sent with the first or second day's shipment.

Field duplicates, field blanks, and lab quality control samples will be taken from the wells as presented in Tables 5-2 and 5-3. Field QA samples will be labeled according to monitoring well location and a suffix that connotates the type of QA sample being collected:

B = Field Blanks
D = Field Duplicates
L = Lab QC Samples

Example: NH-C01-325 B

This is a field blank sample collected at the North Hollywood Cluster Well Location Number 1 from the well screened from 275 feet to 325 feet.

Section 7
SITE HEALTH AND SAFETY

CH2M HILL subcontractor(s) personnel will follow site safety precautions as described in CH2M HILL's Site Safety Plan (SSP). If the supervising CH2M HILL representative considers the activities of the subcontractor in the field to be unsafe, the subcontractor will be directed to stop work, and the CH2M HILL personnel will leave the site. The Draft SSP for the San Fernando Valley Groundwater Basin site is provided in Appendix F. The SSP will be finalized when CH2M HILL and subcontractor personnel have been selected.

Section 8
REFERENCES

CH2M HILL. August 1991. *Recommended RI Well Monitoring Program, San Fernando Valley Basin*. Prepared for U.S. EPA.

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U.S. EPA. *1986. Users Guide to the Contract Lab Program*. December.

Appendix A
MONITORING WELL DESCRIPTIONS AND COPIES OF 1991 THOMAS GUIDE MAPS

DESCRIPTION OF SAN FERNANDO VALLEY BASIN GROUNDWATER MONITORING WELL LOCATIONS					
MONITORING WELL LOCATION	LOCATION	SPECIFIC LOCATION	CITY	THOMAS GUIDE	SAMPLING FREQUENCY QUARTERLY OR ANNUALLY
CS-C01-105	PARISH PL @ Verdugo Av	Sidewalk	BURB		Q
CS-C01-285	PARISH PL @ Verdugo Av	Sidewalk	BURB		Q
CS-C01-558	PARISH PL @ Verdugo Av	Sidewalk	BURB	PG 24-C2	A
CS-VPB-01	ALAMEDA AV @ Main St	Sidewalk	BURB	PG 24-D2	Q
CS-VPB-02	BEACHWOOD DR @ Riverside Dr	Park Lawn	BURB	PG 24-D2	Q
CS-VPB-03	VALENCIA AV @ Flower St	Corner Lawn	BURB	PG 24-E2	A
NH-C04-240	LAKE ST @ Magnolia Av	Burbank PSD	BURB		Q
NH-C04-375	LAKE ST @ Magnolia Av	Burbank PSD	BURB		A
NH-C04-560	LAKE ST @ Magnolia Av	Burbank PSD	BURB	PG 16-D6	A
NH-C06-160	ROSE ST @ Magnolia Av	Sidewalk	BURB		Q
NH-C06-285	ROSE ST @ Magnolia Av	Sidewalk	BURB		A
NH-C06-425	ROSE ST @ Magnolia Av	Sidewalk	BURB	PG 24-A2	A
NH-VPB-12	SAN FERNANDO RD @ Burbank Bl	Sidewalk Lawn	BURB	PG 17-D5	A
NH-VPB-14	MAGNOLIA BL @ Lake St	BPSD Lawn	BURB	PG 17-D6	Q
CS-C03-100	WESTERN AV @ Flower St	City of Glen Prop	GLEN		Q
CS-C03-325	WESTERN AV @ Flower St	City of Glen Prop	GLEN		A
CS-C03-485	WESTERN AV @ Flower St	City of Glen Prop	GLEN		A
CS-C03-560	WESTERN AV @ Flower St	City of Glen Prop	GLEN	PG 24-F2	A
CS-C04-290	FLOWER ST @ Ruberta Av	Grif Mnr Prk Lawn	GLEN		Q
CS-C04-382	FLOWER ST @ Ruberta Av	Grif Mnr Prk Lawn	GLEN		Q
CS-C04-520	FLOWER ST @ Ruberta Av	Grif Mnr Prk Lawn	GLEN	PG 24-F2	A
CS-C06-160	GRANDVIEW AV @ Flower St	Street	GLEN		Q
CS-C06-290	GRANDVIEW AV @ Flower St	Street	GLEN	PG 25-A2	Q
CS-VPB-04	FLOWER ST @ Ruberta Ave	Grif Mnr Prk Lawn	GLEN	PG 24-F2	Q
CS-VPB-06	GRAND VIEW AV @ Flower St	Street	GLEN	PG 25-A2	Q
CS-VPB-07	DANA ST @ Thompson Av	Street	GLEN	PG 24-F1	Q
CS-VPB-08	WINCHESTER AV @ Landall St.	Sidewalk	GLEN	PG 24-E2	Q
CS-VPB-09	GRANDVIEW @ Pelanconi Park	Baseball Fld	GLEN	PG 25-A2	A
CS-VPB-10	CALIFORNIA AV @ Chester St	Street	GLEN	PG 25-B3	Q
CS-VPB-11	KENILWORTH AV @ Freemont Pk	Parking	GLEN	PG 25-B3	Q
VD-VPB-01	MAYFIELD AV @ La Cresenta AV	Street	GLEN	PG 18-E2	A
VD-VPB-02	SUNVIEW DR @ Ocean View Bl	Street	GLEN	PG 18-F3	A
VD-VPB-03	COLINA DR @ Canada Bl	Street	GLEN	PG 18-E6	A
VD-VPB-04	SANTA MARIA AV @ Canada bL	Street	GLEN	PG 18-E5	A
VD-VPB-05	BROADVIEW DR @ Roselawn Av	Street	GLEN	PG 18-E3	A
VD-VPB-06	FAIRCHILD ST @ Dunsmore Av	Street	GLEN	PG 11-C6	A
CS-C02-062	MAIN ST @ Riverside Dr	Equestrian Ctr	LA		Q
CS-C02-180	MAIN ST @ Riverside Dr	Equestrian Ctr	LA		Q
CS-C02-250	MAIN ST @ Riverside Dr	Equestrian Ctr	LA		Q
CS-C02-335	MAIN ST @ Riverside Dr	Equestrian Ctr	LA	PG 24-E2	Q
CS-C06-185	CUTTER ST @ San Fernando Rd	Street	LA		A
CS-C06-278	CUTTER ST @ San Fernando Rd	Street	LA	PG 25-B3	A
CS-VPB-08	CUTTER ST @ San Fernando Rd	Street	LA	PG 25-B3	Q
NH-C01-325	KESWICK ST @ Tujunga Av	Sidewalk Lawn	LA		Q

DESCRIPTION OF SAN FERNANDO VALLEY BASIN GROUNDWATER MONITORING WELL LOCATIONS					
MONITORING WELL LOCATION	LOCATION	SPECIFIC LOCATION	CITY	THOMAS GUIDE	SAMPLING FREQUENCY QUARTERLY OR ANNUALLY
NH-C01-460	KESWICK ST @ Tujunga Av	Sidewalk Lawn	LA		A
NH-C01-660	KESWICK ST @ Tujunga Av	Sidewalk Lawn	LA		A
NH-C01-780	KESWICK ST @ Tujunga Av	Sidewalk Lawn	LA	PG 16 -D2	A
NH-C02-220	CAHUENGA BL @ Erwin St	Street	LA		Q
NH-C02-325	CAHUENGA BL @ Erwin St	Street	LA		Q
NH-C02-520	CAHUENGA BL @ Erwin St	Street	LA		A
NH-C02-681	CAHUENGA BL @ Erwin St	Street	LA	PG 16-F5	A
NH-C03-380	FARMDALE AV @ Vanowen St	ROW Trans Line	LA		A
NH-C03-580	FARMDALE AV @ Vanowen St	ROW Trans Line	LA		Q
NH-C03-680	FARMDALE AV @ Vanowen St	ROW Trans Line	LA		A
NH-C03-800	FARMDALE AV @ Vanowen St	ROW Trans Line	LA	PG 16-D4	A
NH-C05-320	GENTRY AV @ Saticoy St	Street	LA		A
NH-C05-460	GENTRY AV @ Saticoy St	Street	LA	PG 16-C3	A
NH-VP8-01	CLARK AV @ Keystone St	Sch Lawn	LA	PG 24-C1	Q
NH-VP8-02	ARCHWOOD AV @ Vantge St	Street	LA	PG 16-C4	A
NH-VP8-03	ERWIN ST @ Lankershim Bl	Sidewalk	LA	PG 16-D5	A
NH-VP8-04	COLLINS ST @ Vineland Av	Street	LA	PG 16-E6	A
NH-VP8-05	CLYBOURNE AV @ Victory Bl	Sidewalk	LA	PG 16-F5	Q
NH-VP8-06	RADFORD ST @ Sherman Rd	ROW Trans Line	LA	PG 16-C3	Q
NH-VP8-07	VALERIO ST @ Backman Av	Sidewalk	LA	PG 16-D3	Q
NH-VP8-08	VINELAND AV @ Erwin St	ROW Trans Line	LA	PG 16-E5	Q
NH-VP8-09	VINELAND AV @ Strathern St	LA Library Pkg	LA	PG 16-E2	Q
NH-VP8-10	ARMINITA ST @ De Garmo Av	Church Lawn	LA	PG 16-F2	A
NH-VP8-11	BEEMAN AV @ s/o Strathern St	Street	LA	PG 16-B2	A
NH-VP8-13	VENA AVE @ LAC Flood Control	Off Vena	LA	PG 09-B5	A
PO-C01-195	GOODWIN AV @ Brunswick	Street	LA		A
PO-C01-354	GOODWIN AV @ Brunswick Av	Street	LA	PG 25-B5	A
PO-C02-053	LOS FELIZ RD @ Revere Av	Sidewalk Lawn	LA		Q
PO-C02-205	LOS FELIZ RD @ Revere Av	Sidewalk Lawn	LA	PG 25-C6	A
PO-C03-182	GARDEN AV @ Garcia St	Sidewalk Lawn	LA		Q
PO-C03-235	GARDEN AV @ Garcia St	Sidewalk Lawn	LA	PG 35-C2	A
PO-VP8-01	BRUNSWICK AV @ Appleton St	Street	LA	PG 35-C1	Q
PO-VP8-02	GOODWIN AV @ Brunswick Av	Street	LA	PG 25-B5	Q
PO-VP8-03	GARDEN AV @ Garcia St	Sidewalk Lawn	LA	PG 35-C2	Q
PO-VP8-04	AVE 33 @ Eagle Rock Bl	Street	LA	PG 35-E2	Q
PO-VP8-05	GILROY ST @ Ripple St	Sidewalk Lawn	LA	PG 35-D2	A
PO-VP8-06	QUEEN ST @ Blake Av	Street	LA	PG 35-D3	A
PO-VP8-07	ANDRITA ST @ San Fernando Rd	Street	LA	PG 35-D1	Q
PO-VP8-08	CRYSTAL ST @ Doris Pl	Street	LA	PG 35-E4	Q
PO-VP8-09	VERDUGO RD @ Eagle Rock Bl	Street	LA	PG 35-E3	A
PO-VP8-10	PALMER AV @ Maryland Av	Street	LA	PG-25-C5	A
PO-VP8-11	CRESTMORE PL @ Eagle Rock Bl	Sidewalk Lawn	LA	PG 35-E1	A
VD-VP8-07	ORANGE COVE @ Briggs Av	Street	LAC	PG 11-E6	A

DETAIL


SEE MAP 10
A
B
C
D
E
F
1
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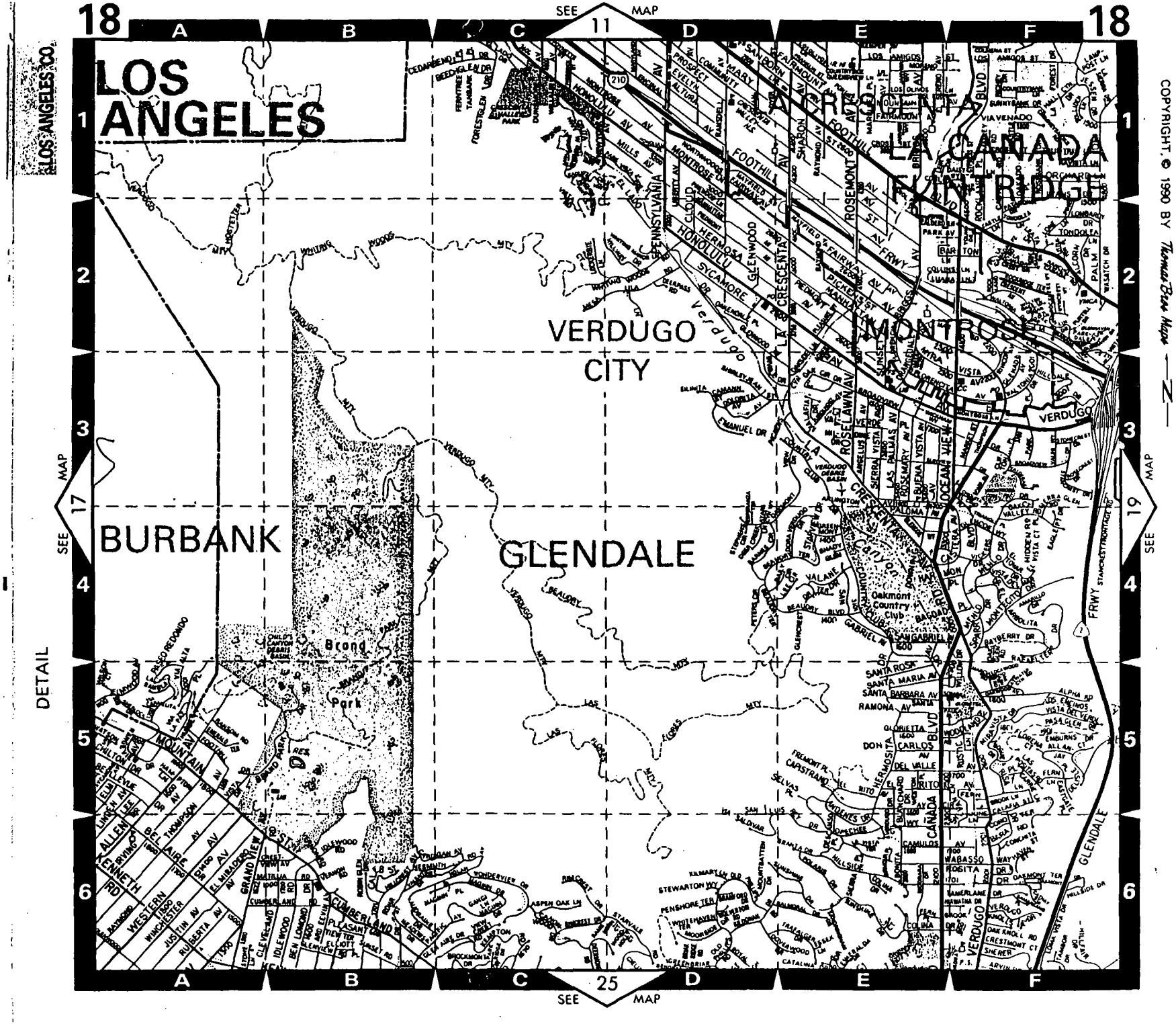
6
LOS ANGELES
LOS ANGELES CO.
VERDUGO
MOUNTAINS
BURBANK
GLENDALE
STARLIGHT THEATRE
STOUGH PARK
DE BELL GOLF COURSE
WILDWOOD CANYON PARK
SUNSET DEBRIS BASIN
STOUGH DEBRIS BASIN
BURBANK-GLENDALE-PASADENA AIRPORT
TERMINAL
LOCKHEED AIRCRAFT
LOCKHEED AIRCRAFT CORP.
PIERCE BROS VALHALLA CEM
SEE MAP 16
SEE MAP 18
DETAIL
GLENOAKS BLVD
SAN FERNANDO BLVD
GOLDEN STATE FWY
VICTORY BLVD
EMPIRE AV
VANOWEN ST
HOLLYWOOD WY
BURBANK BL
CHANDLER BLVD
MAGNOLIA BL
OLIVE AV
VERDUGO AV
KENNETH RD
SUNSET CANYON DR
BRAND BLVD
FRONT ST
TUJUNGA AV
FLOWER ST
SCOTT RD
WALNUT AV
CYPRESS AV
ALLEN AV
GLENOAKS BLVD


LOS ANGELES CO.
DETAIL
18
A
B
C
D
E
F
SEE MAP 11
SEE MAP 17
SEE MAP 19
SEE MAP 25
1
2
3
4
5
6
LOS ANGELES
BURBANK
GLENDALE
VERDUGO CITY
LA CANADA FLINTRIDGE
MONTROSE
ALTADENA
Verdugo Park
Oakmont Country Club
FOOTHILL BLVD
VERDUGO
HONOLULU
SYCAMORE
PENNSYLVANIA
CRESCENTA
ROSEMONT
FRWY
GLENDALE
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24
SEE MAP 17
24
A
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E
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1
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6
SEE MAP 23
SEE MAP 25
LOS ANGELES CO.
DETAIL
BURBANK
GLENDALE
LOS ANGELES
UNIVERSAL CITY
GLENDALE
Griffith Park
Forest Lawn Mem. Park (Hollywood Hills)
Lakeside Country Club
Harding Golf Course
Wilson Golf Course
MT. HOLLYWOOD EL. 1652'
MT. CAHUENGA EL. 1821'
BIRD SANCTUARY
ZOO
FOREST LAWN DR
GRIFFITH PARK
HOLLYWOOD
VISTA DEL VALLE
BARHAM BLVD
CAHUENGA BL
RIVERSIDE FRWY
VENTURA FRWY
HOLLYWOOD RESERVOIR
LAKE HOLLYWOOD DR
MULHOLLAND HWY
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25
SEE MAP 18
25
A
B
C
D
E
F
1
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3
4
5
6
SEE MAP 24
SEE MAP 26
SEE MAP 35
GLENDALE
LOS ANGELES
Griffith Park
Harding Golf Course
Wilson Golf Course
BROADWAY
COLORADO
WILSON
LEXINGTON
BURCHETT
VENTURA
GLENOAKS BLVD
BRAND BLVD
CENTRAL AV
GLENDALE AV
VERDUGO RD
FERNANDO RD
GOLDEN STATE FRWY
GLENDALE FRWY
CHEVY CHASE DR
HARVARD
CARLTON
ORANGE GROVE
MAPLE
CHASE
ACACIA
GARFIELD
WINDSOR
LOMITA
ELK
VINE
DORAN ST
MOUNTAIN ST
STOCKER
KENNETH
SONORA AV
CANADA BLVD
FELIZ RD
PALMER
YORK BLVD
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LOS ANGELES CO.
DETAIL

26
SEE MAP 19
26
A
B
C
D
E
F
1
2
3
4
5
6
SEE MAP 25
SEE MAP 27
SEE MAP 36
GLENDALE
PASADENA
OLD ARROYO
ROSE BOWL
EAGLE ROCK RES
SCHOOL CANYON PARK
SCHOOL CANYON BALL FIELDS
SCHOOL CANYON GOLF COURSE AND TENNIS COURT COMPLEX
CHEVY CHASE COUNTRY COURSE
ART CENTER COLLEGE OF DESIGN
OCCIDENTAL COLLEGE
VENTURA FRWY
FOOTHILL FRWY
LONG BEACH FRWY
GLENOAKS BLVD
COLORADO BLVD
WASHINGTON BLVD
CALIFORNIA BL
LOS ANGELES CO.
DETAIL
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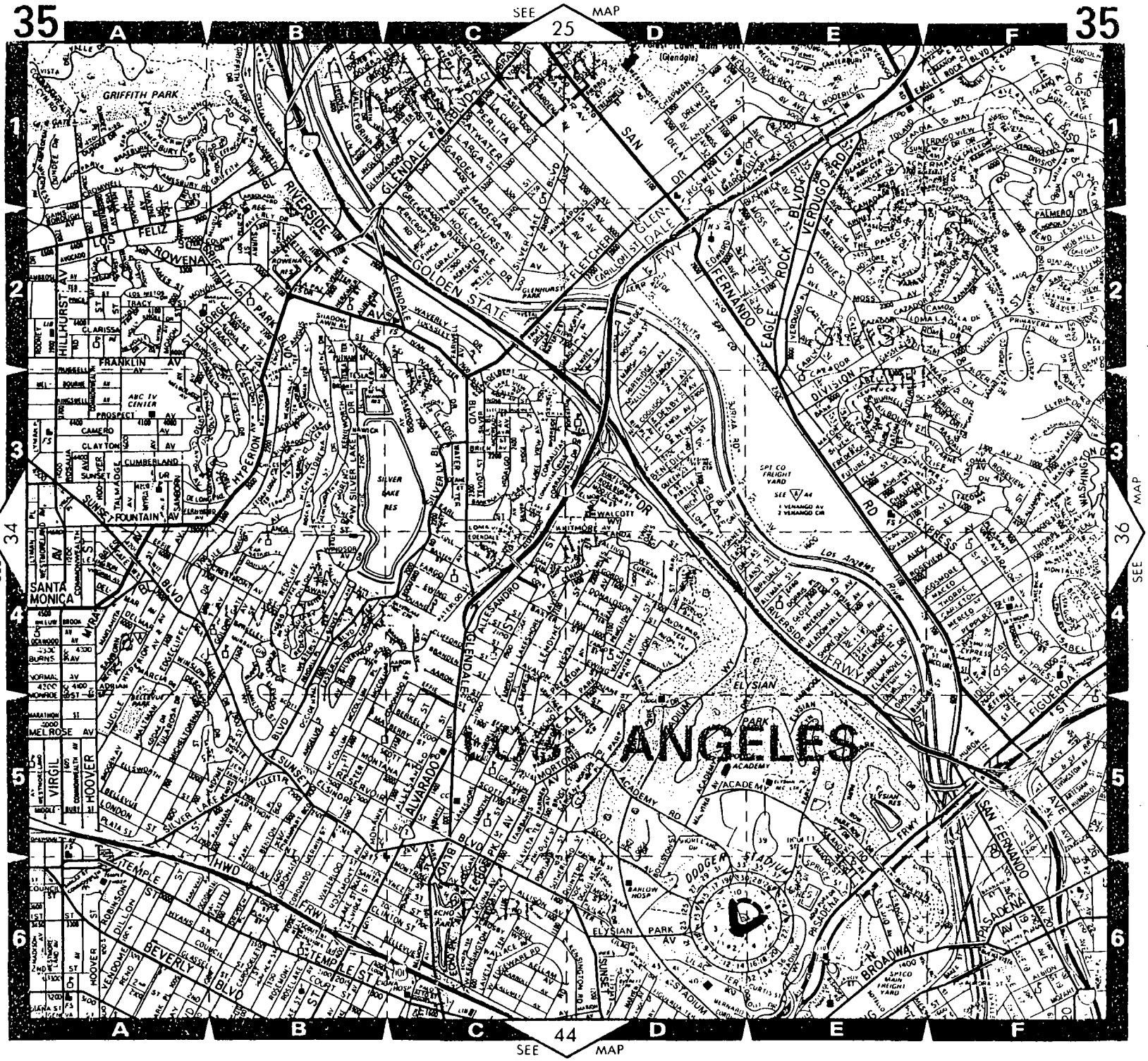
35
SEE MAP 25
35
A
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C
D
E
F
1
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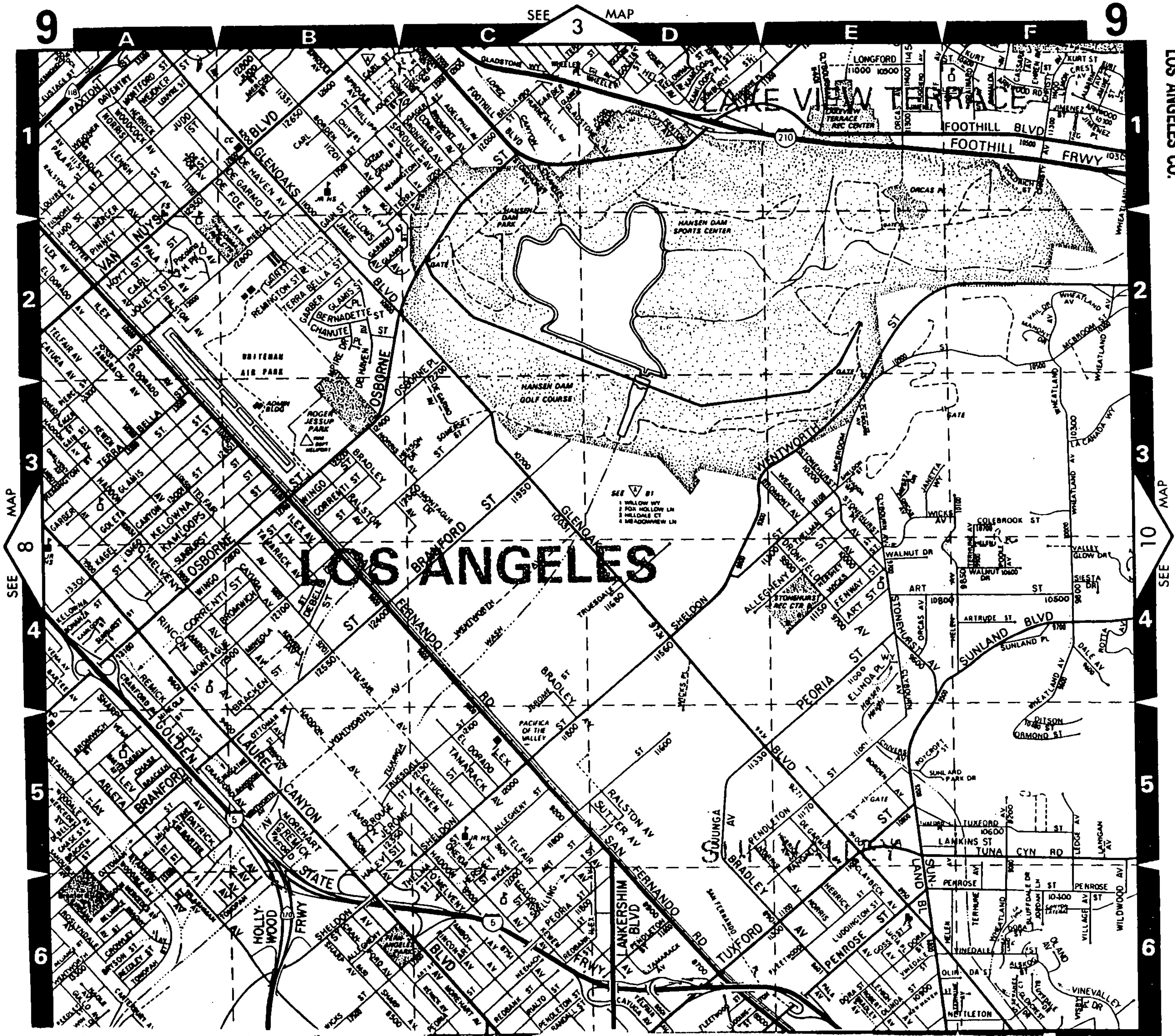
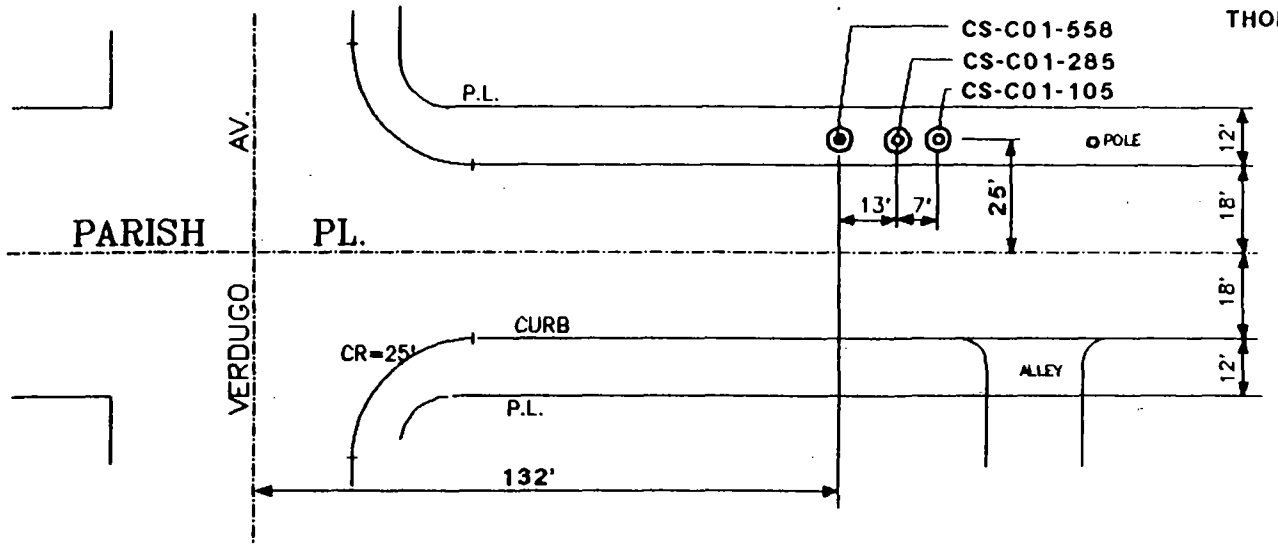
4
5
6
SEE MAP 34
SEE MAP 36
SEE MAP 44
LOS ANGELES CO.
DETAIL
COPYRIGHT © 1990 BY Thomas Bros Maps
GRIFFITH PARK
LOS FELIZ
ROWENA
RIVERSIDE
GLENDALE
GOLDEN STATE
SAN DIEGO FWY
EAGLE ROCK
VERDUGO RD
FERNANDO
HILLHURST AV
FRANKLIN AV
PROSPECT AV
CAMERO
CLAYTON
CUMBERLAND
SUNSET BLVD
FOUNTAIN AV
SANTA MONICA
MELROSE AV
VIRGIL
HOOVER
HYPERION
SILVER LAKE RES
SILVER LAKE BLVD
ALLESANDRO
ALVARADO
WALCOTT
WHITMORE
LOS ANGELES
ELYSIAN PARK
ACADEMY RD
DODGER STADIUM
SAN FERNANDO
PASADENA FWY
FIGUEROA
BROADWAY
TEMPLE ST
BEVERLY BLVD
SPI CO FREIGHT YARD
SEE A/44
1 VENANGO AV
2 VENANGO CIR
LOS ANGELES RIVER



LOS ANGELES CO.

DETAIL

Appendix B
SCALED DRAWINGS OF MONITORING WELL LOCATIONS



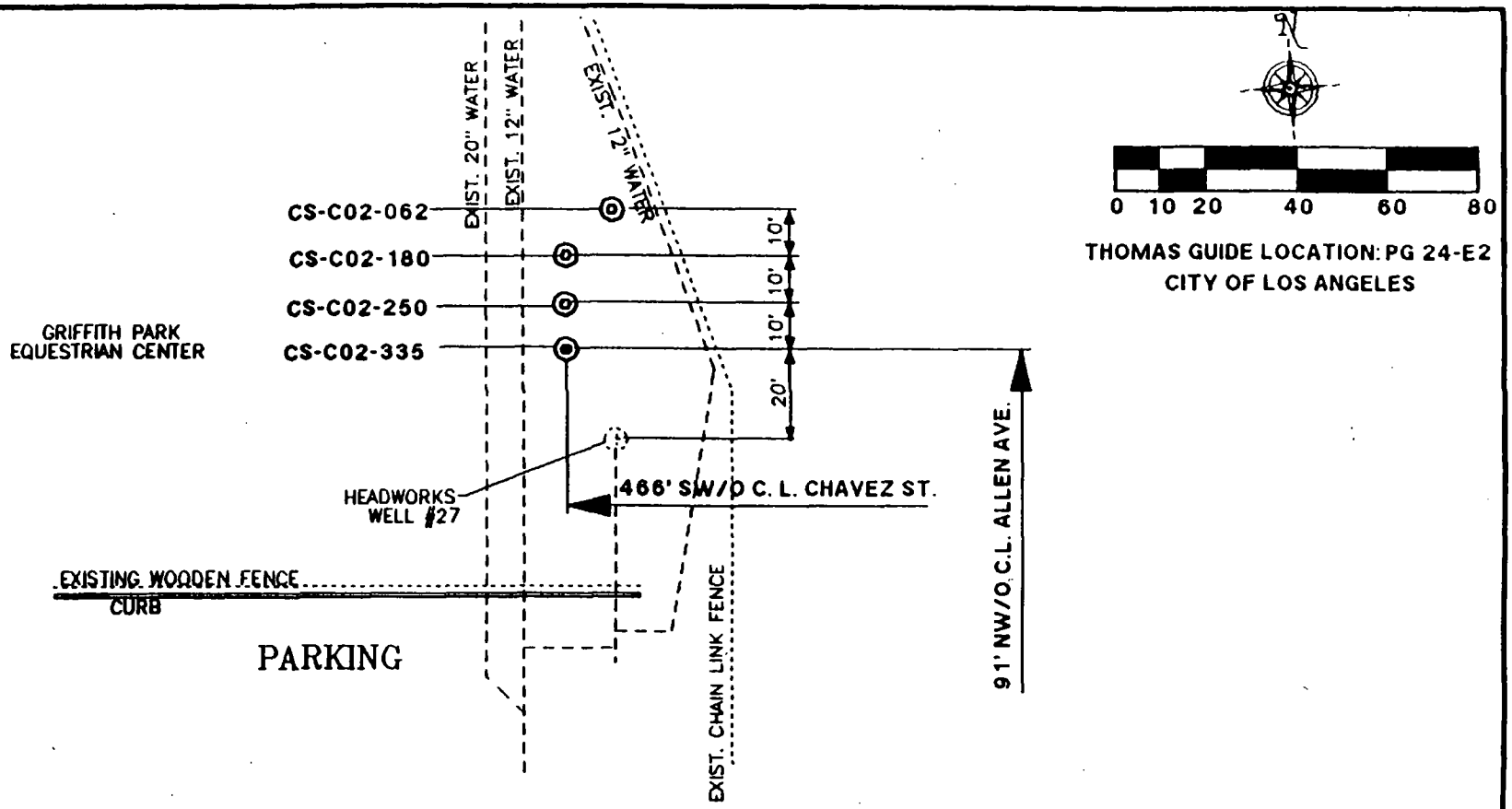
0 10 20 40 60 80

THOMAS GUIDE LOCATION: PG 24-C2
CITY OF BURBANK

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **CRYSTAL SPRINGS NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **CS-C01**

CSC01 DRW: 04/91

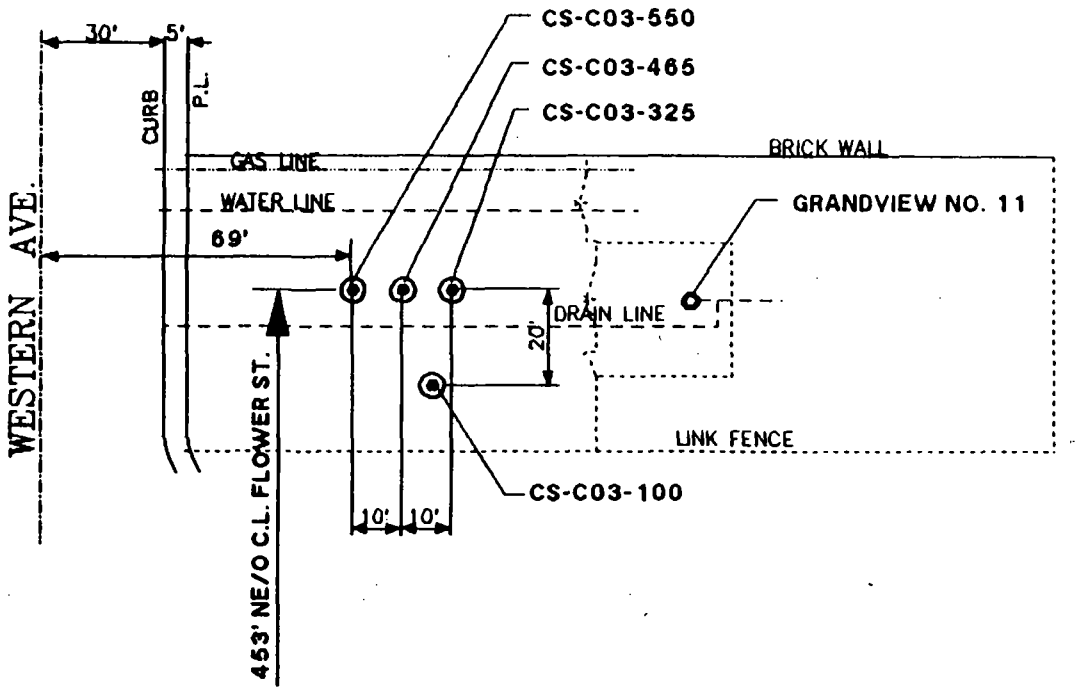


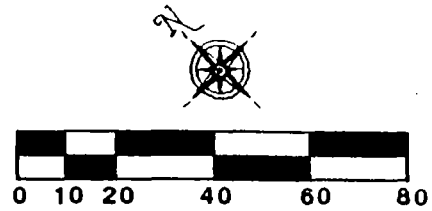
THOMAS GUIDE LOCATION: PG 24-E2
CITY OF LOS ANGELES

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **CRYSTAL SPRINGS NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **CS-C02**

CSC02 AVA 04/91



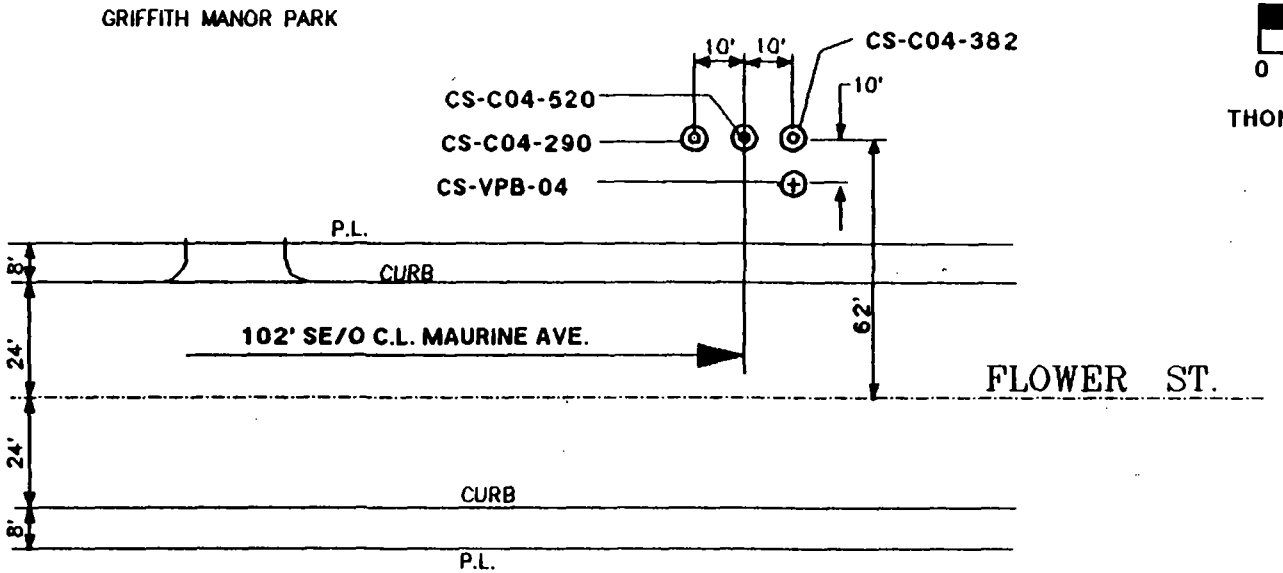


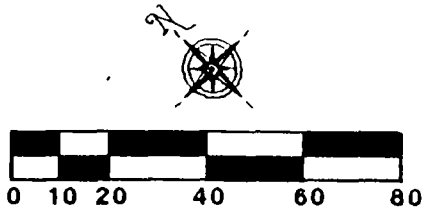
THOMAS GUIDE LOCATION: PG 24-F2
CITY OF GLENDALE

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **CRYSTAL SPRINGS NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **CS-C03**

C8C03.DRW: AVA 04/91



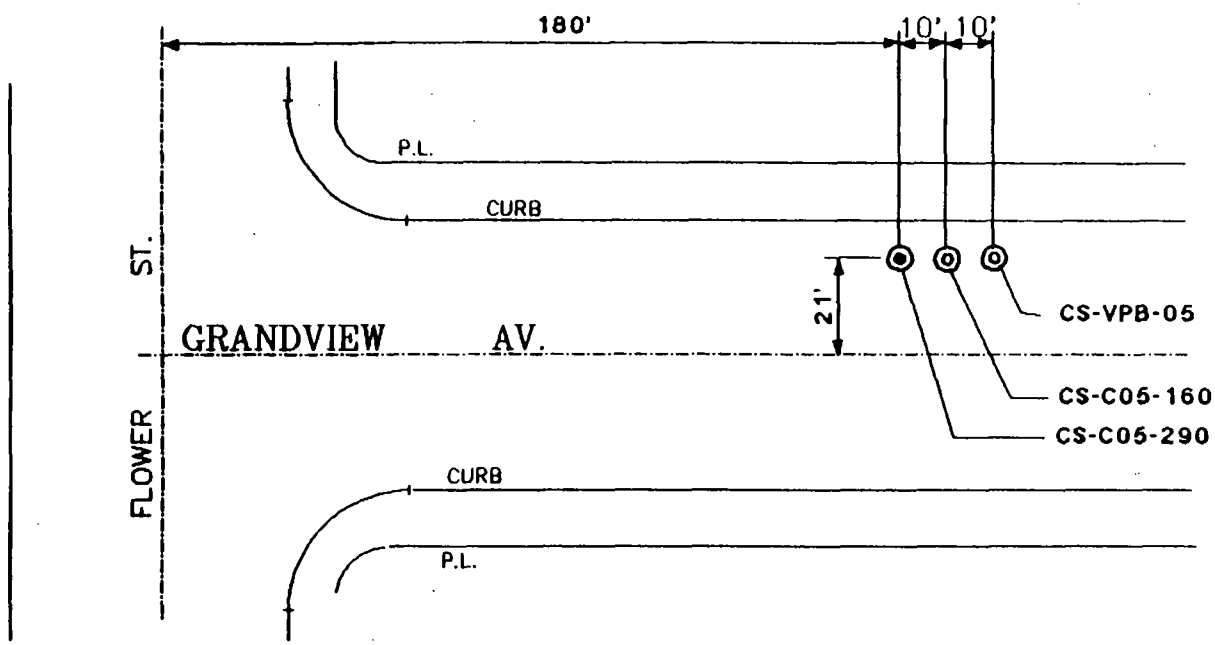


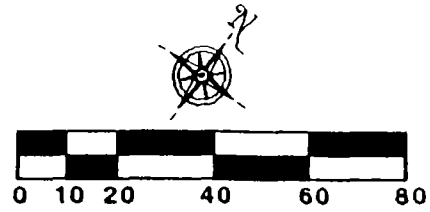
THOMAS GUIDE LOCATION: PG 24-F2
CITY OF GLENDALE

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **CRYSTAL SPRINGS NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **CS-C04**

CSC04 DRW. 04/91





THOMAS GUIDE LOCATION: PG 25-A2
CITY OF GLENDALE

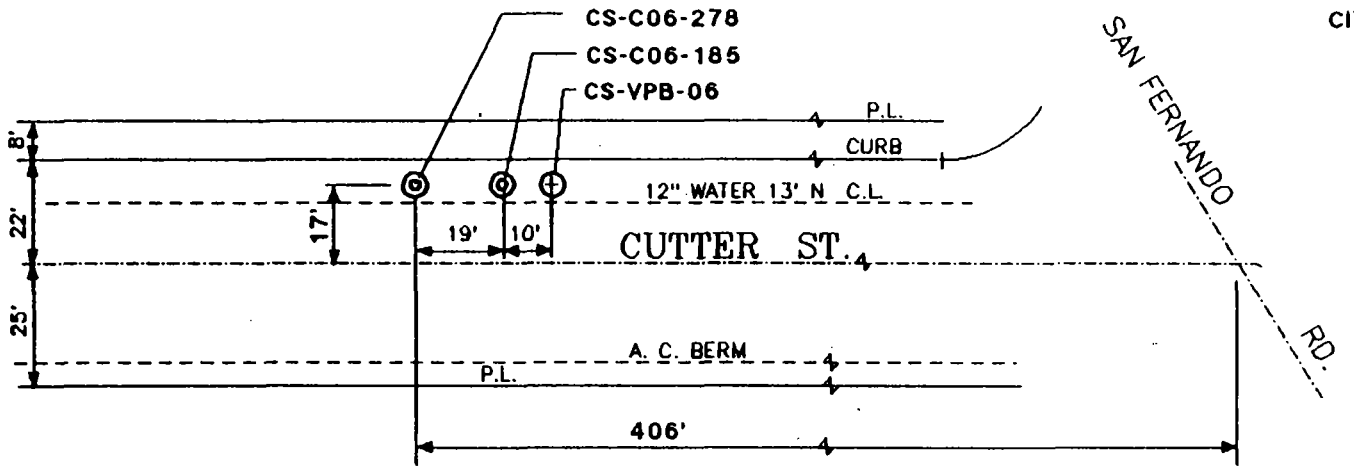
AS CONSTRUCTED 04/91

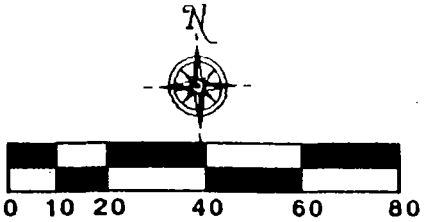
L. A. D. W. P.
CLUSTER WELL LOCATION
CRYSTAL SPRINGS NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

WELL NAME:
CS-C05

CSC05.DRW AVA 04/91



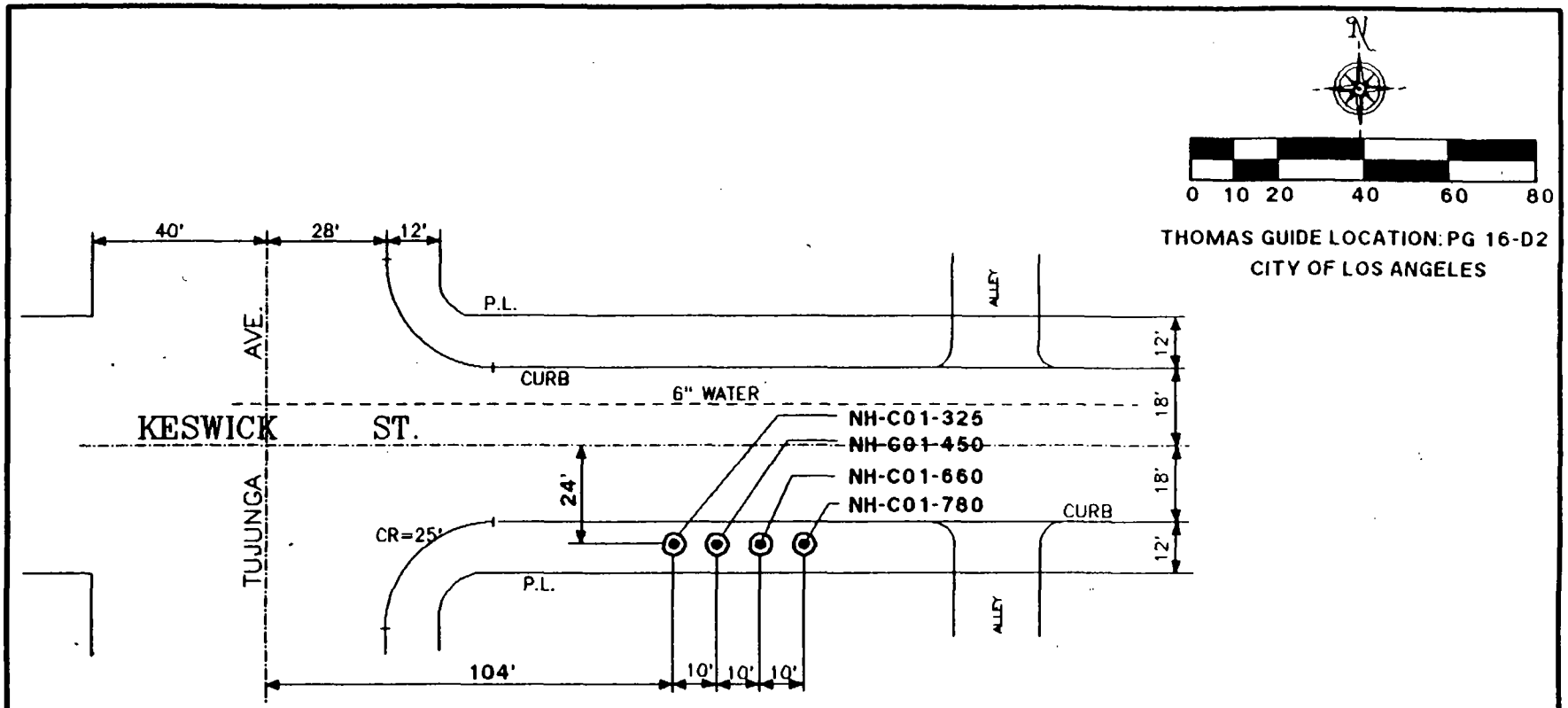


THOMAS GUIDE LOCATION: PG 25-B3
CITY OF LOS ANGELES

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **CRYSTAL SPRINGS NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **CS-C06**

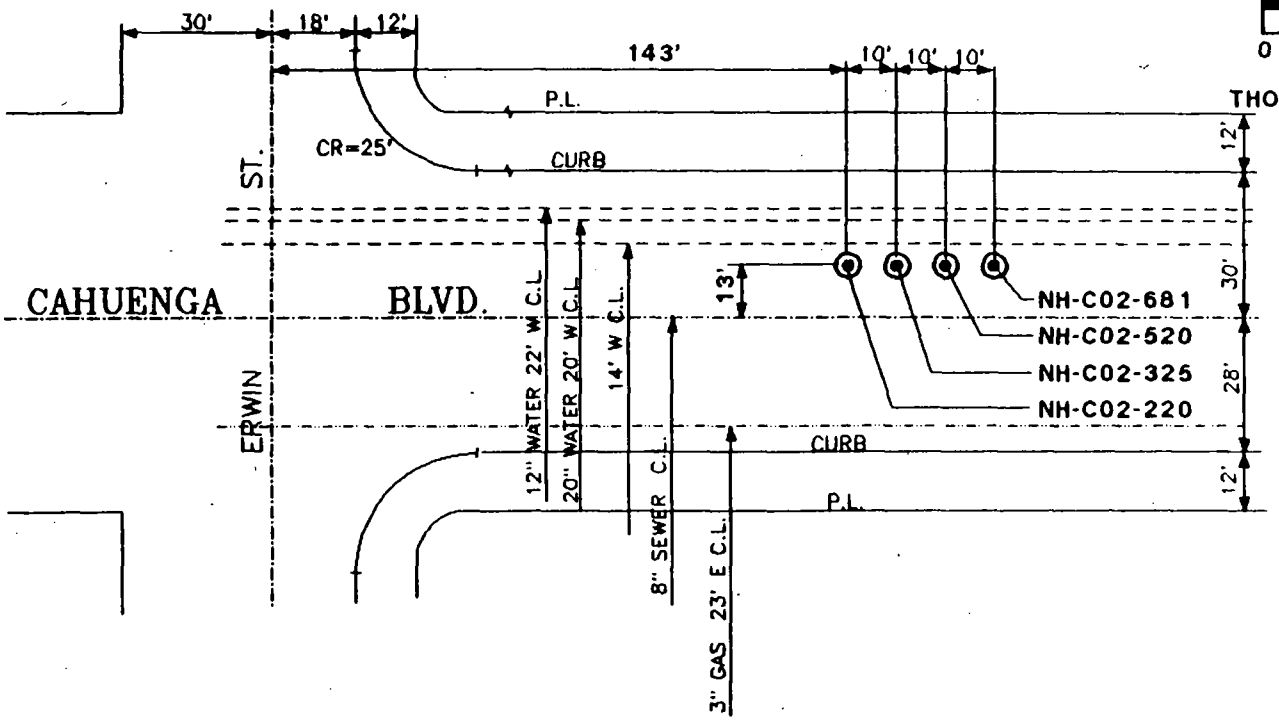
CSC06.DRW AVA 04/91



AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **NORTH NOLLYWOOD NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **NH-C01**

NHC01 DRW. 04/91



THOMAS GUIDE LOCATION: PG 16-F5
CITY OF LOS ANGELES

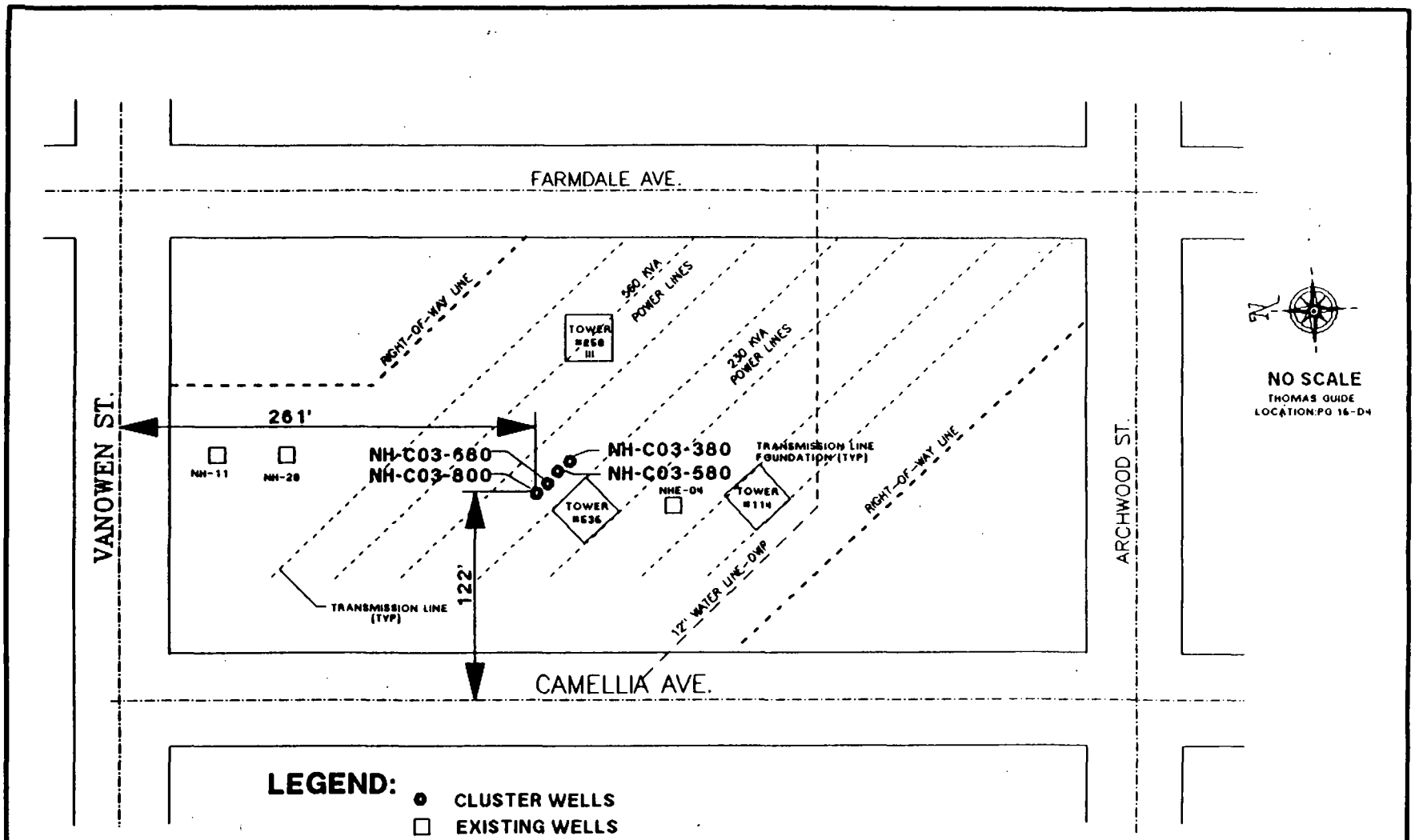
AS CONSTRUCTED 04/91

L. A. D. W. P.
CLUSTER WELL LOCATION
NORTH NOLLYWOOD NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

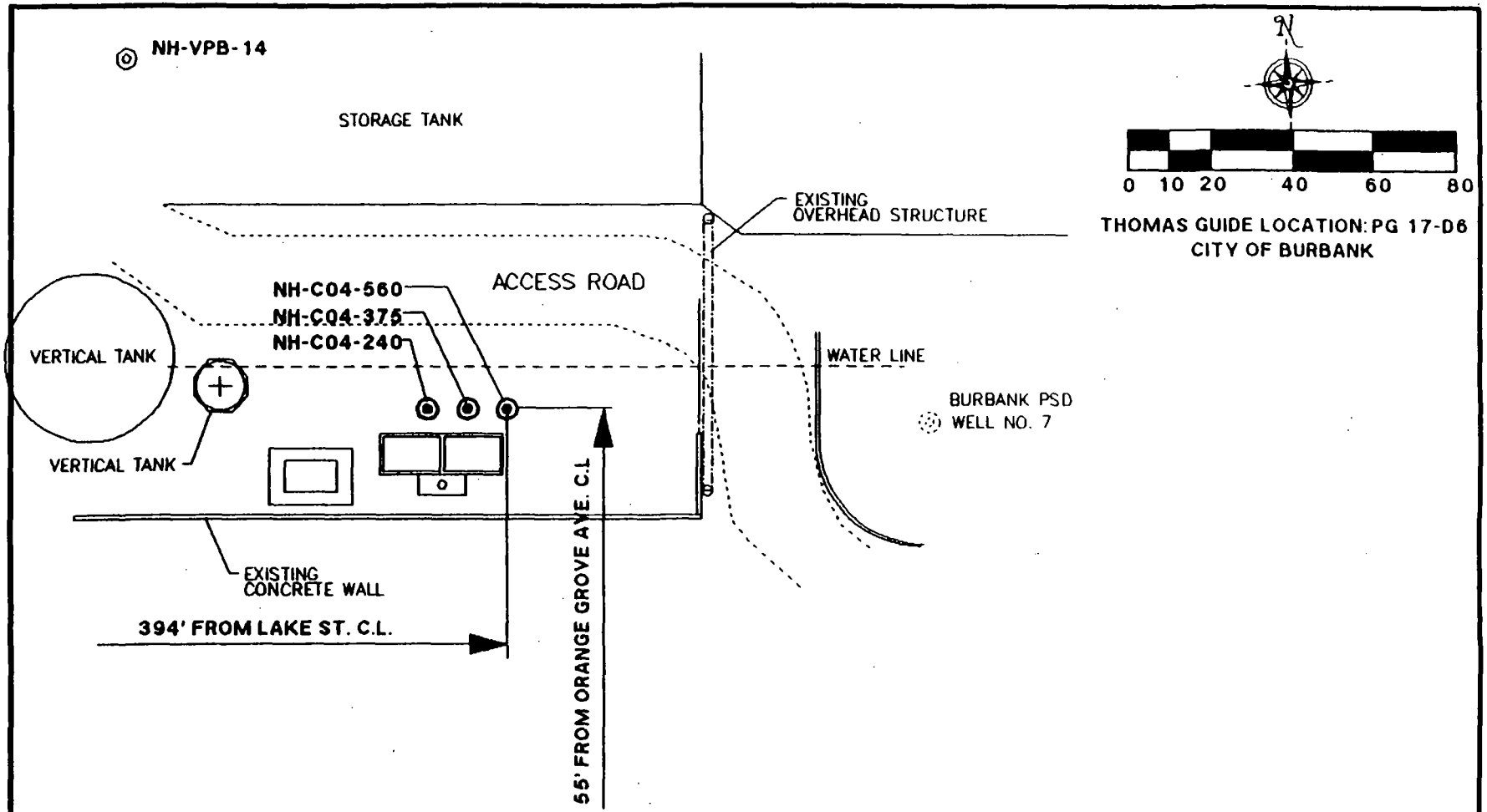
WELL NAME:
NH-C02

NHC02 DRW. 04/91



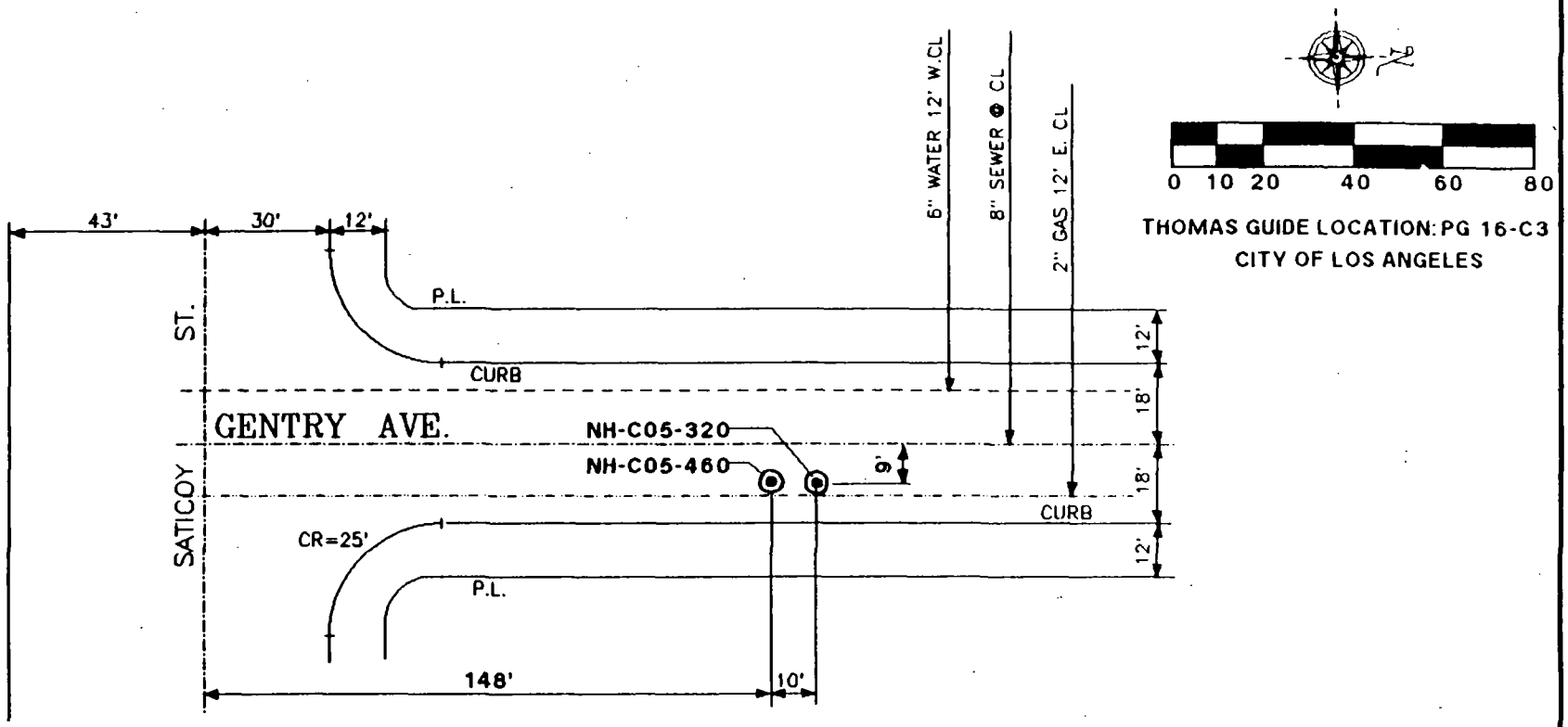
L. A. D. W. P. **CLUSTER WELL LOCATION** **NORTH HOLLYWOOD NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **NH-C03**

NHC03.DRW 04/91



L. A. D. W. P. **CLUSTER WELL LOCATION** **NORTH HOLLYWOOD NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **NH-C04**

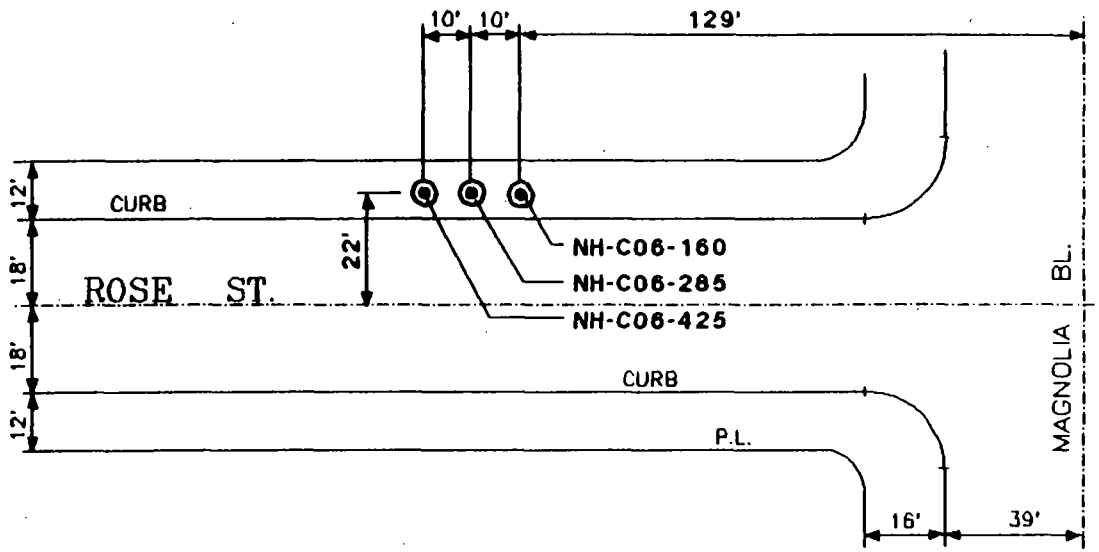
NHC04 DRW 04/91



AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **NORTH NOLLYWOOD NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **NH-C05**

NHC05 DRW 04/91



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THOMAS GUIDE LOCATION: PG 24-A2

CITY OF BURBANK

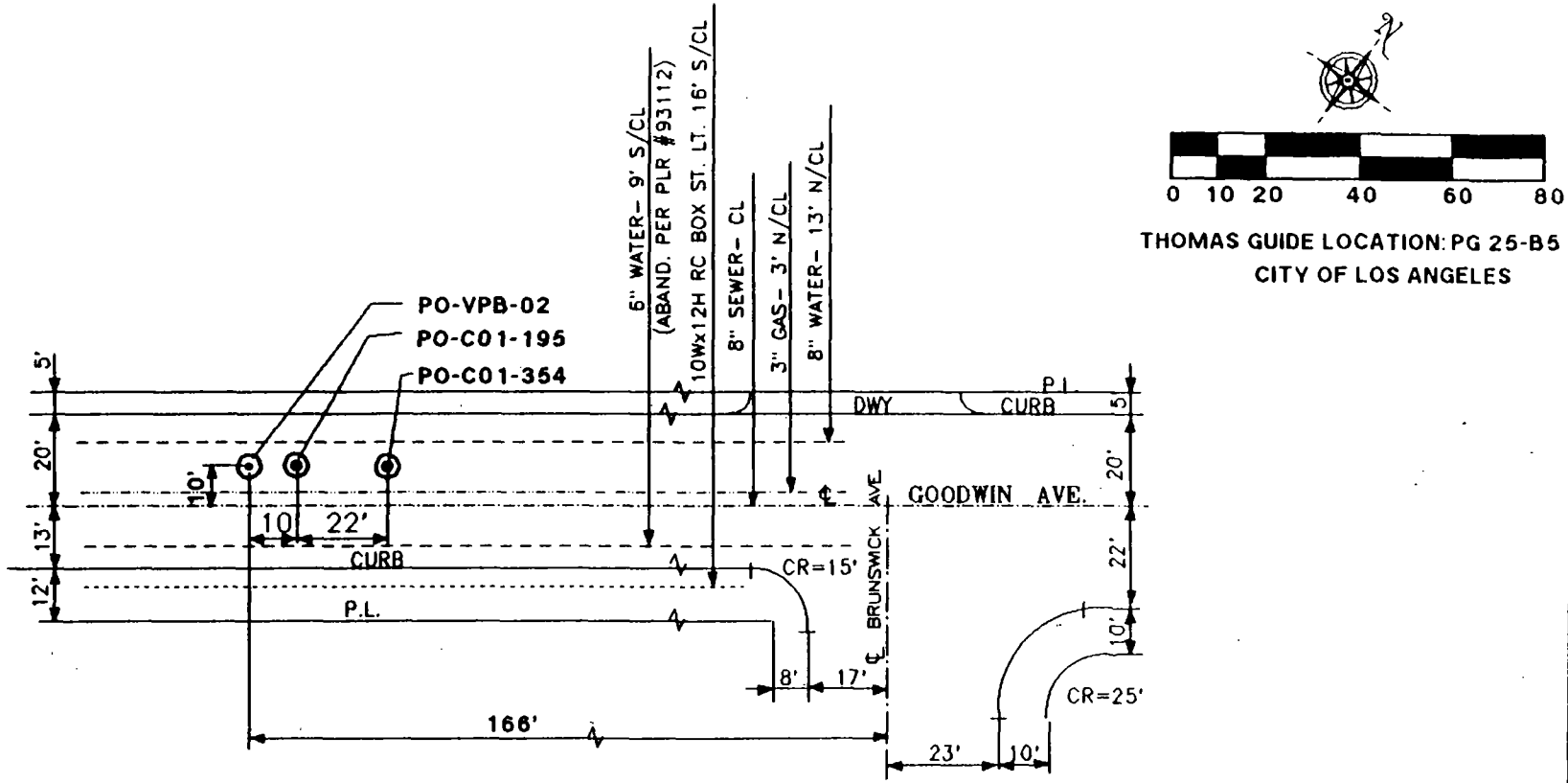
AS CONSTRUCTED 04/91

L. A. D. W. P.
CLUSTER WELL LOCATION
NORTH NOLLYWOOD NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

WELL NAME:
NH-C06

NHC06.DRW AVA 04/91

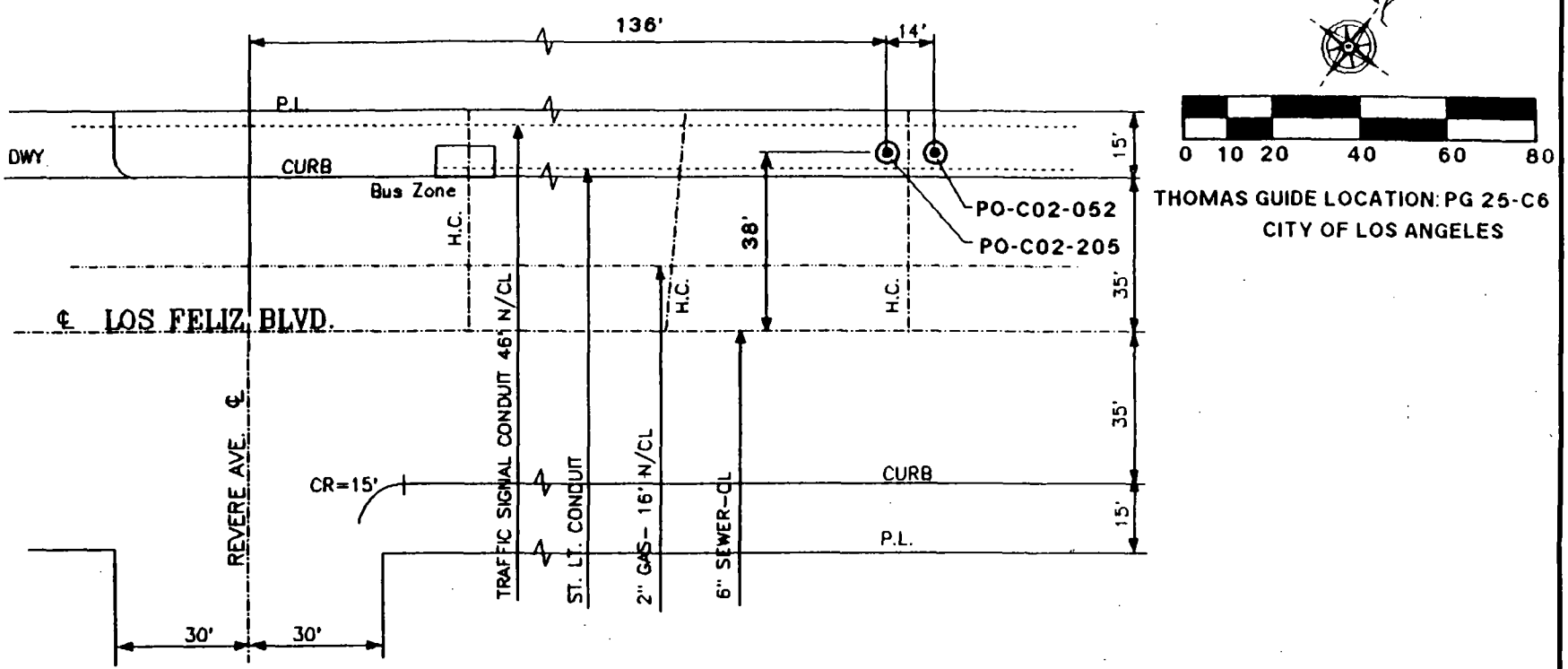


THOMAS GUIDE LOCATION: PG 25-B5
CITY OF LOS ANGELES

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **POLLOCK NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **PO-C01**

POC01.DRW. AVA 04/91



THOMAS GUIDE LOCATION: PG 25-C6
CITY OF LOS ANGELES

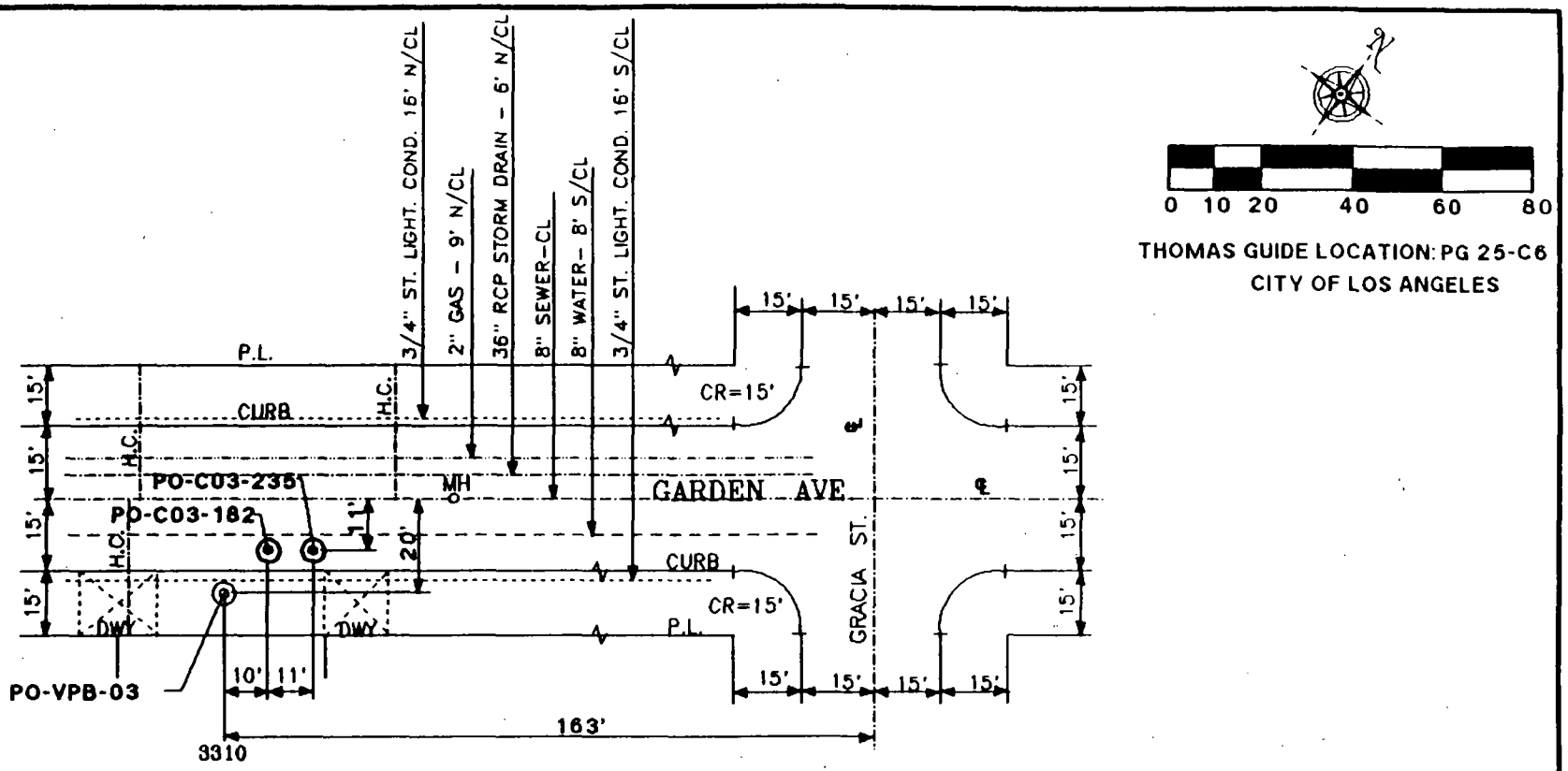
AS CONSTRUCTED 04/91

L. A. D. W. P.
CLUSTER WELL LOCATION
POLLOCK NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

WELL NAME:
PO-C02

POC02.DRW AVA 04/91

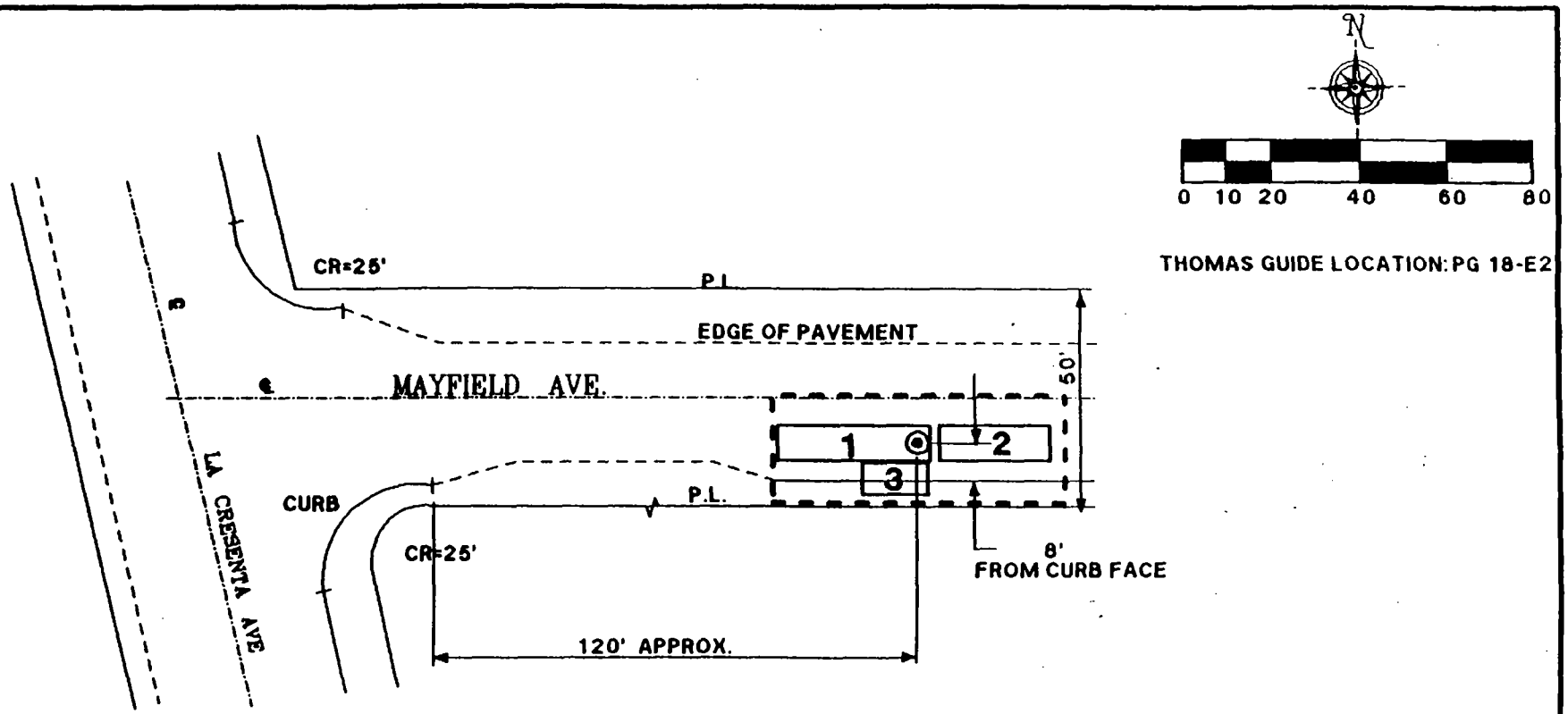


THOMAS GUIDE LOCATION: PG 25-C6
CITY OF LOS ANGELES

AS CONSTRUCTED 04/91

L. A. D. W. P. **CLUSTER WELL LOCATION** **POLLOCK NPL SITE**	**PREPARED BY:** SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEP'T OF WATER & POWER	**WELL NAME:** **PO-C03**

POC03 DRW 04/91



THOMAS GUIDE LOCATION: PG 18-E2

BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
VERDUGO NPL SITE

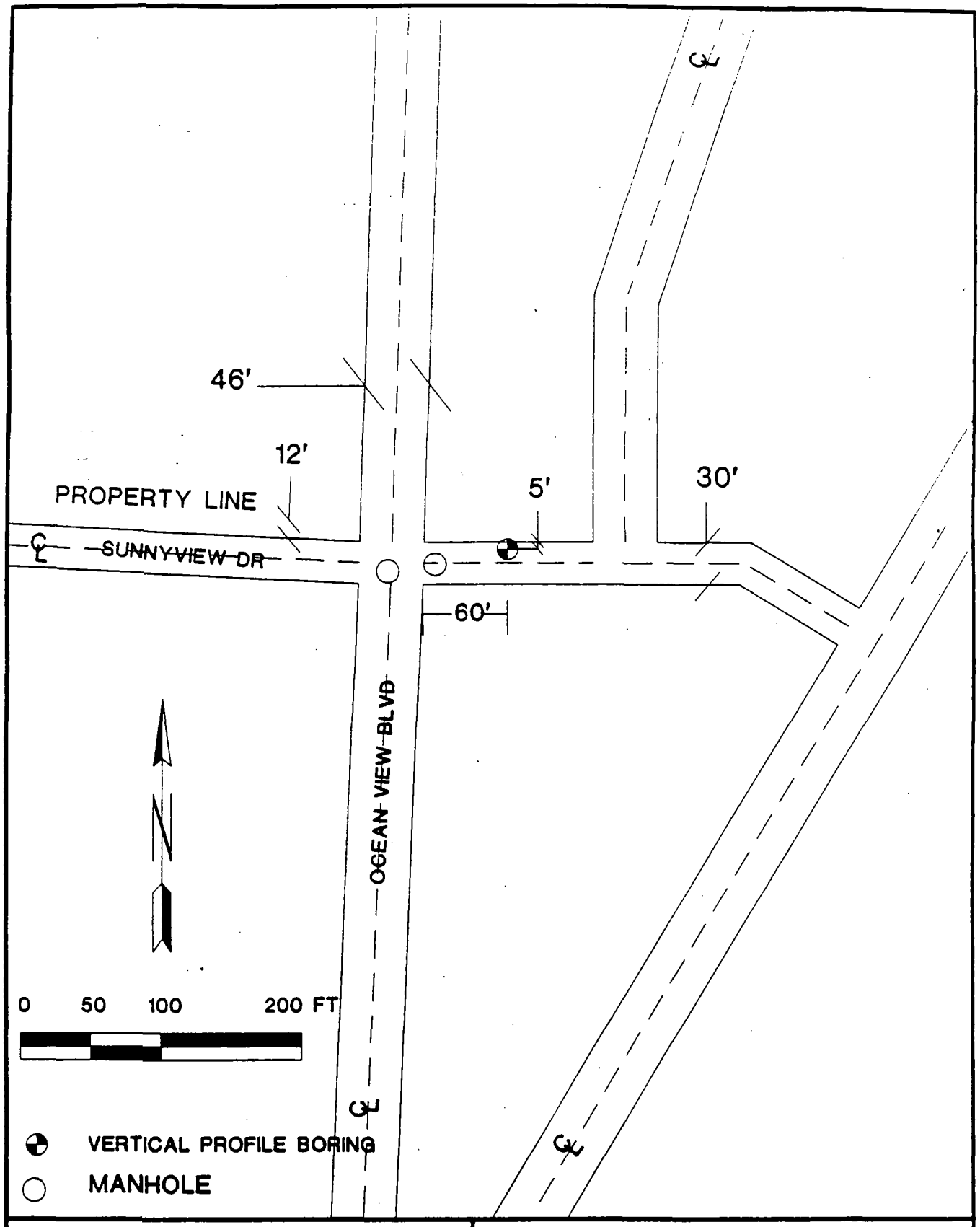
PREPARED BY:

SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.

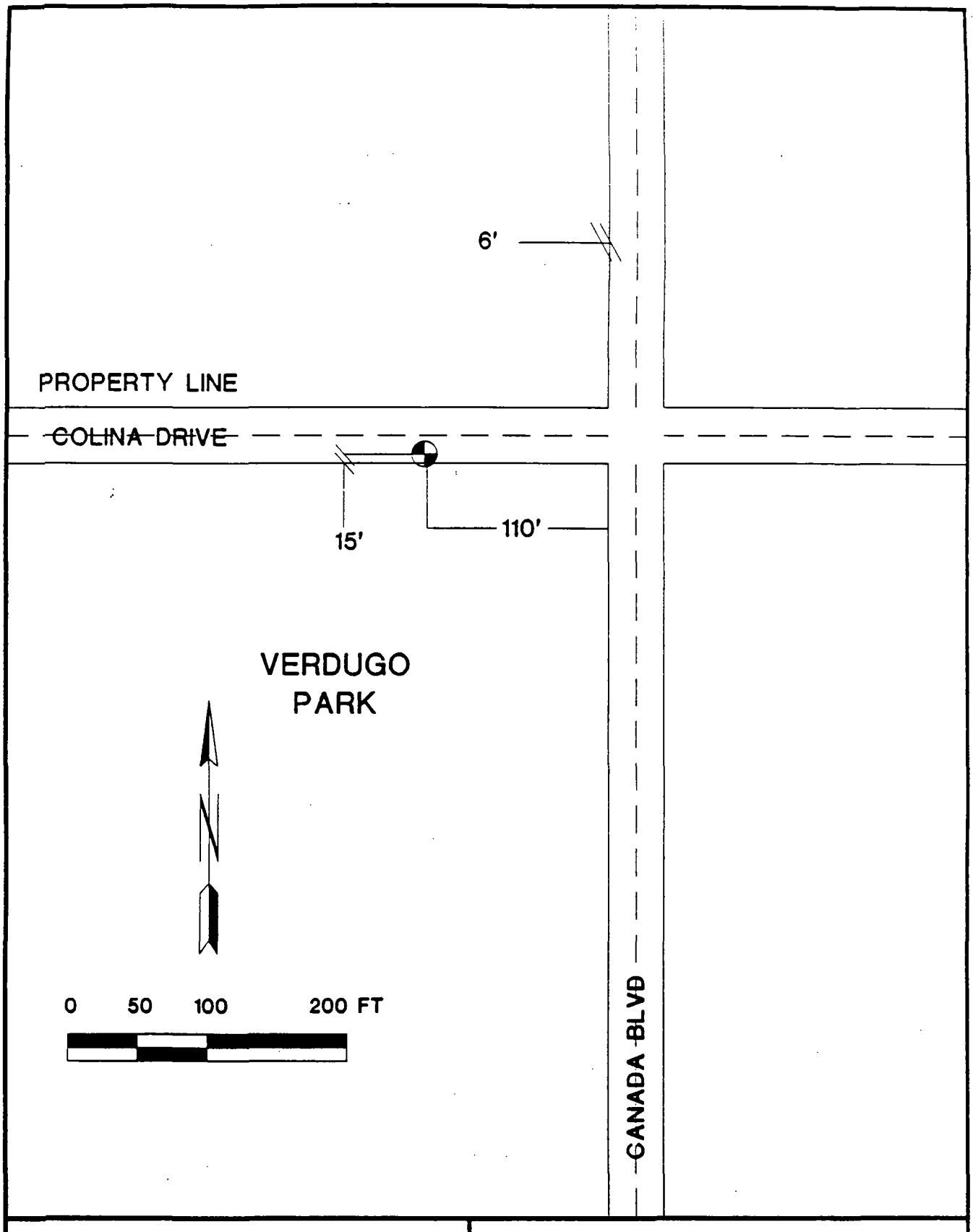
VD-VPB-01

VDVPB-01 AVA 10/89

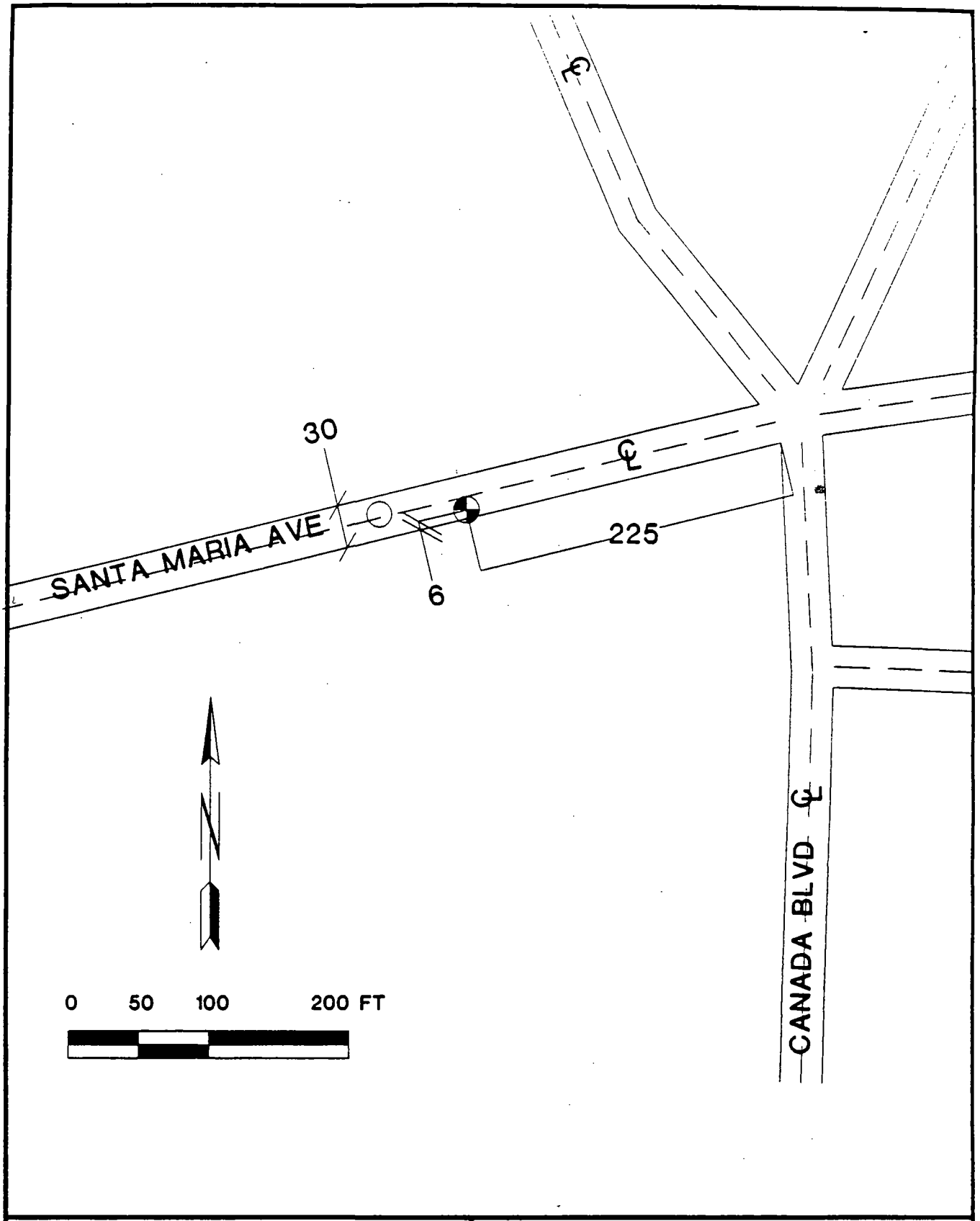


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
VERDUGO NPL SITE

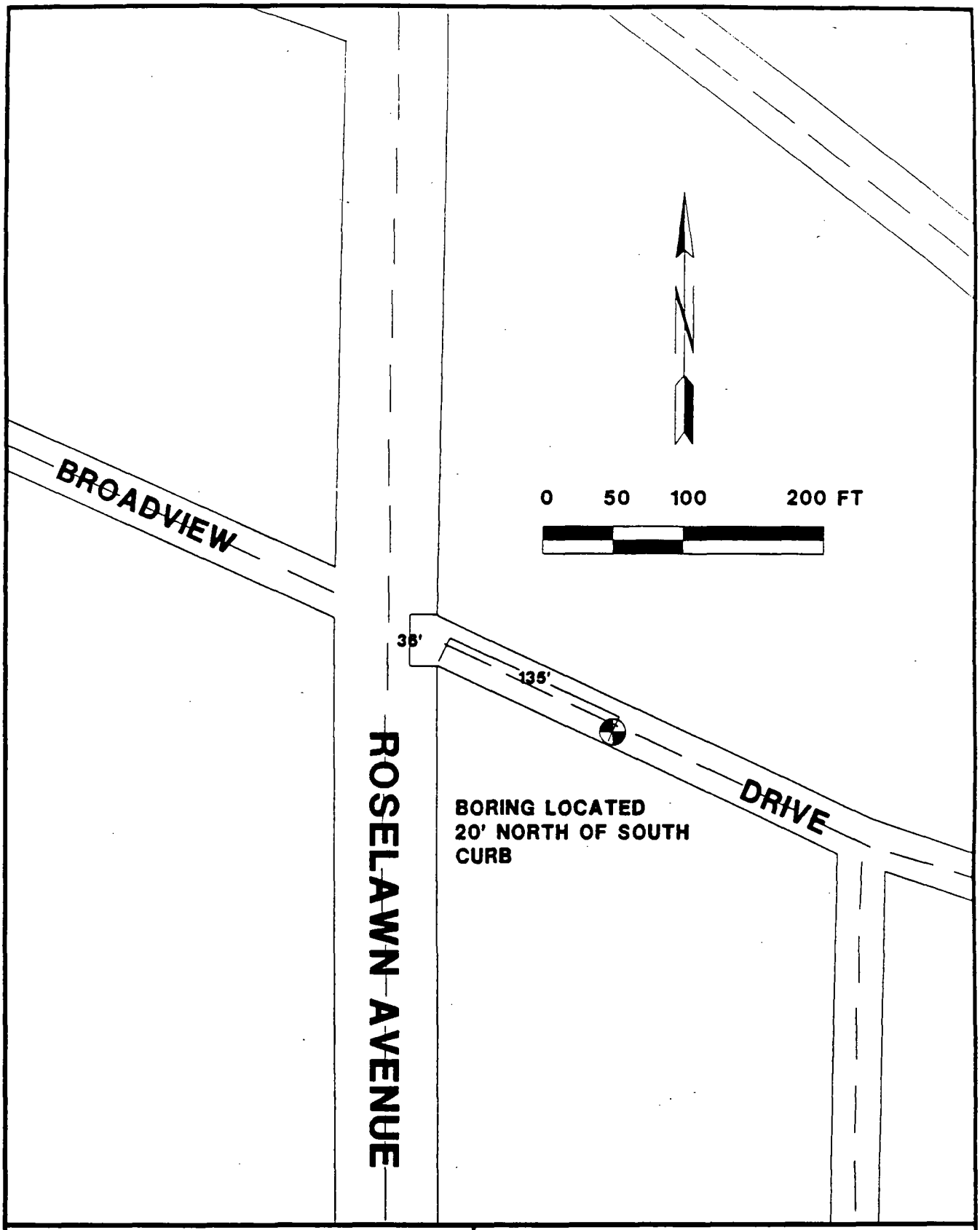
VERTICAL PROFILE BORINGS
LOCATION OF BORING
VD-VPB-02



L.A.D.W.P. SAN FERNANDO VALLEY R.I. VERDUGO NPL SITE	VERTICAL PROFILE BORINGS LOCATION OF BORING VD-VPB-03

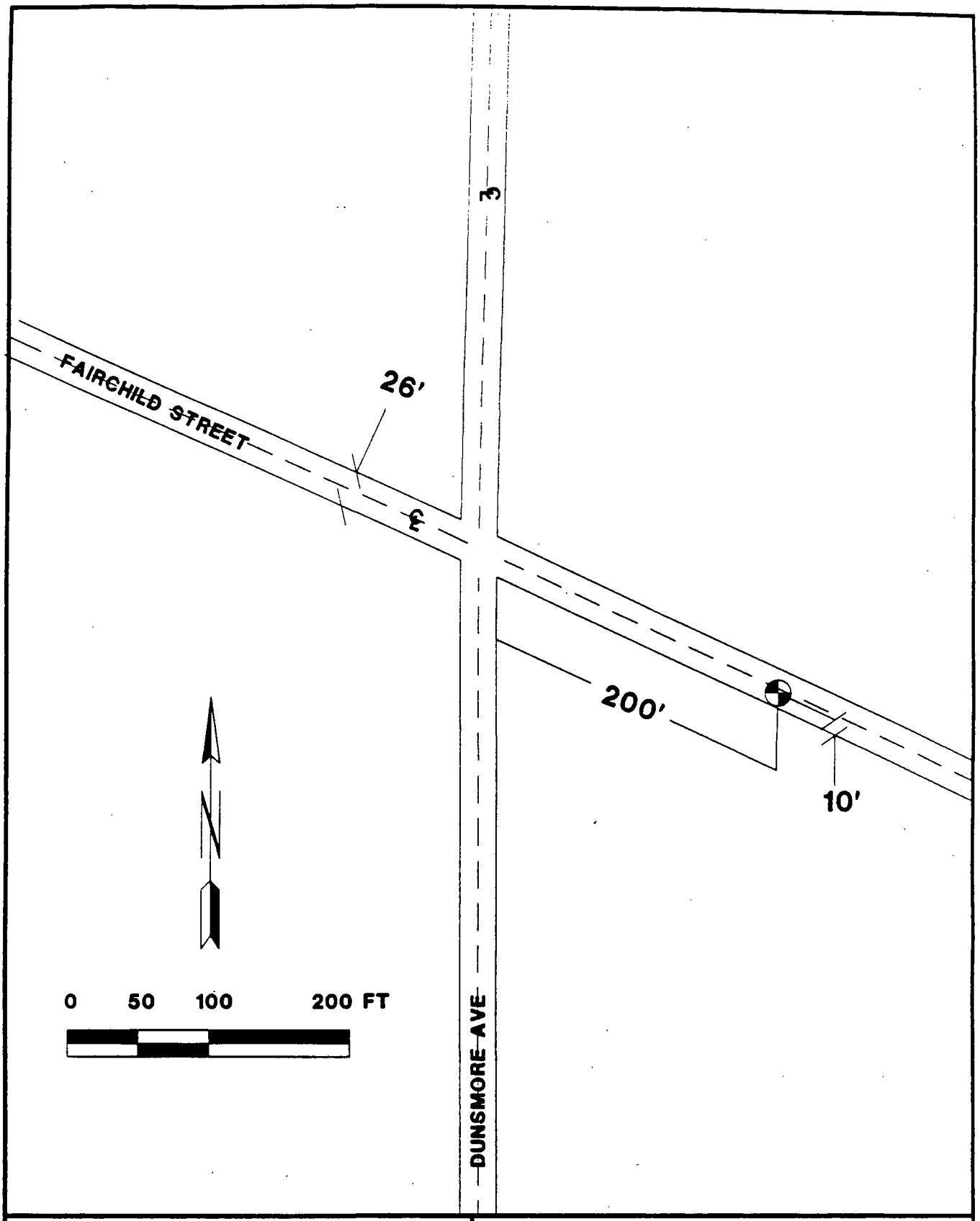


L.A.D.W.P. SAN FERNANDO VALLEY R.I. VERDUGO NPL SITE	VERTICAL PROFILE BORINGS LOCATION OF BORING VD-VPB-04

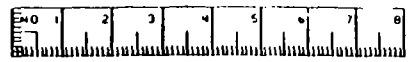


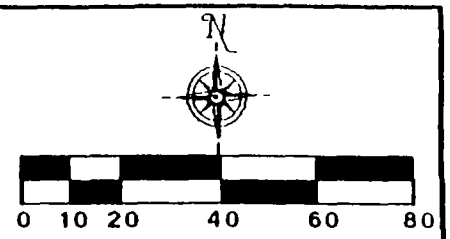
L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
VERDUGO NPL SITE

VERTICAL PROFILE BORINGS
LOCATION OF BORING
VD-VPB-05

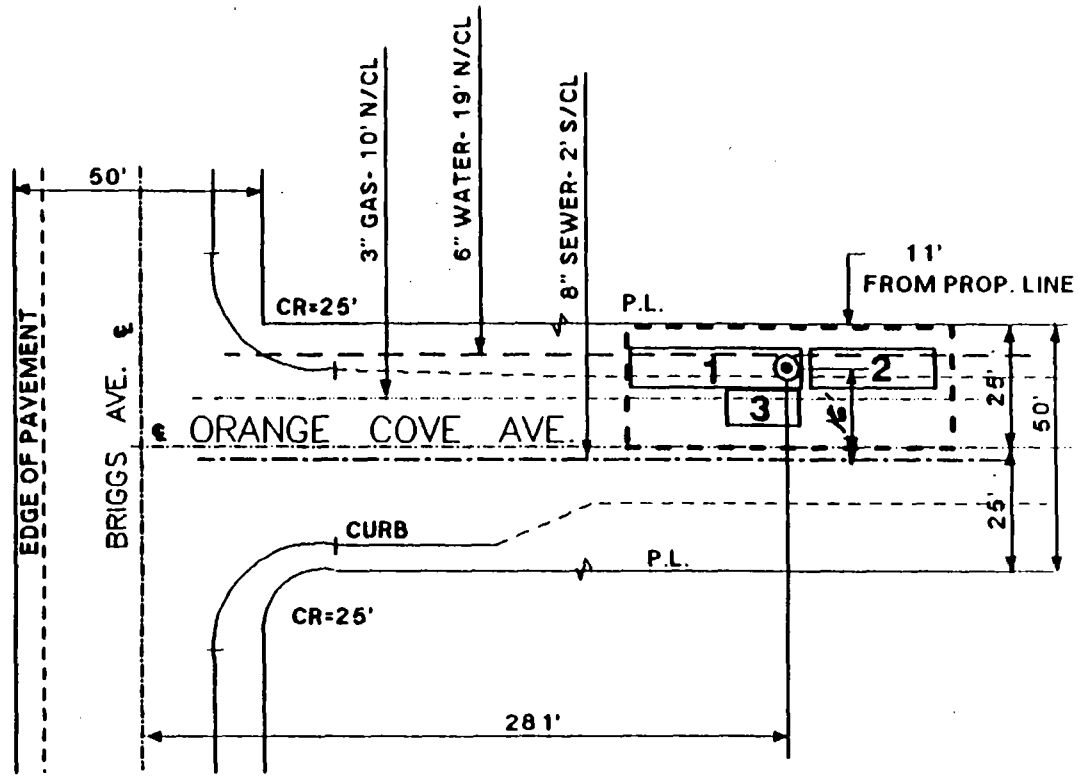


L.A.D.W.P. SAN FERNANDO VALLEY R.I. VERDUGO NPL SITE	VERTICAL PROFILE BORINGS LOCATION OF BORING VD-VPB-06





THOMAS GUIDE LOCATION: PG 11-E6



◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

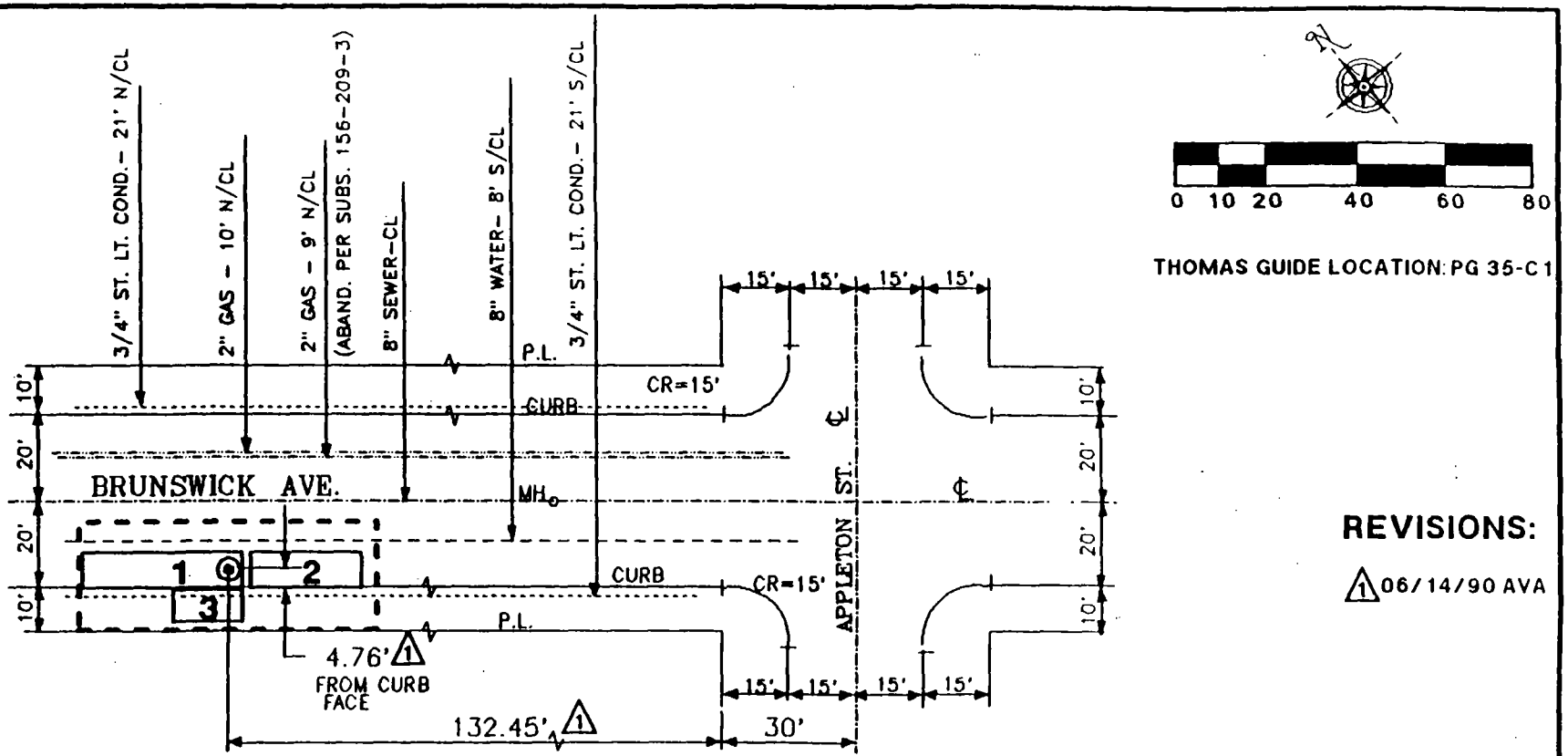
- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

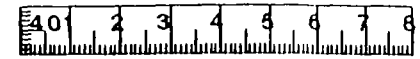
L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
VERDUGO NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

DRAWING NO.
VD-VPB-07

VDVPB-07 AVA 10/89





THOMAS GUIDE LOCATION: PG 35-C 1

REVISIONS:

1 06/14/90 AVA

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

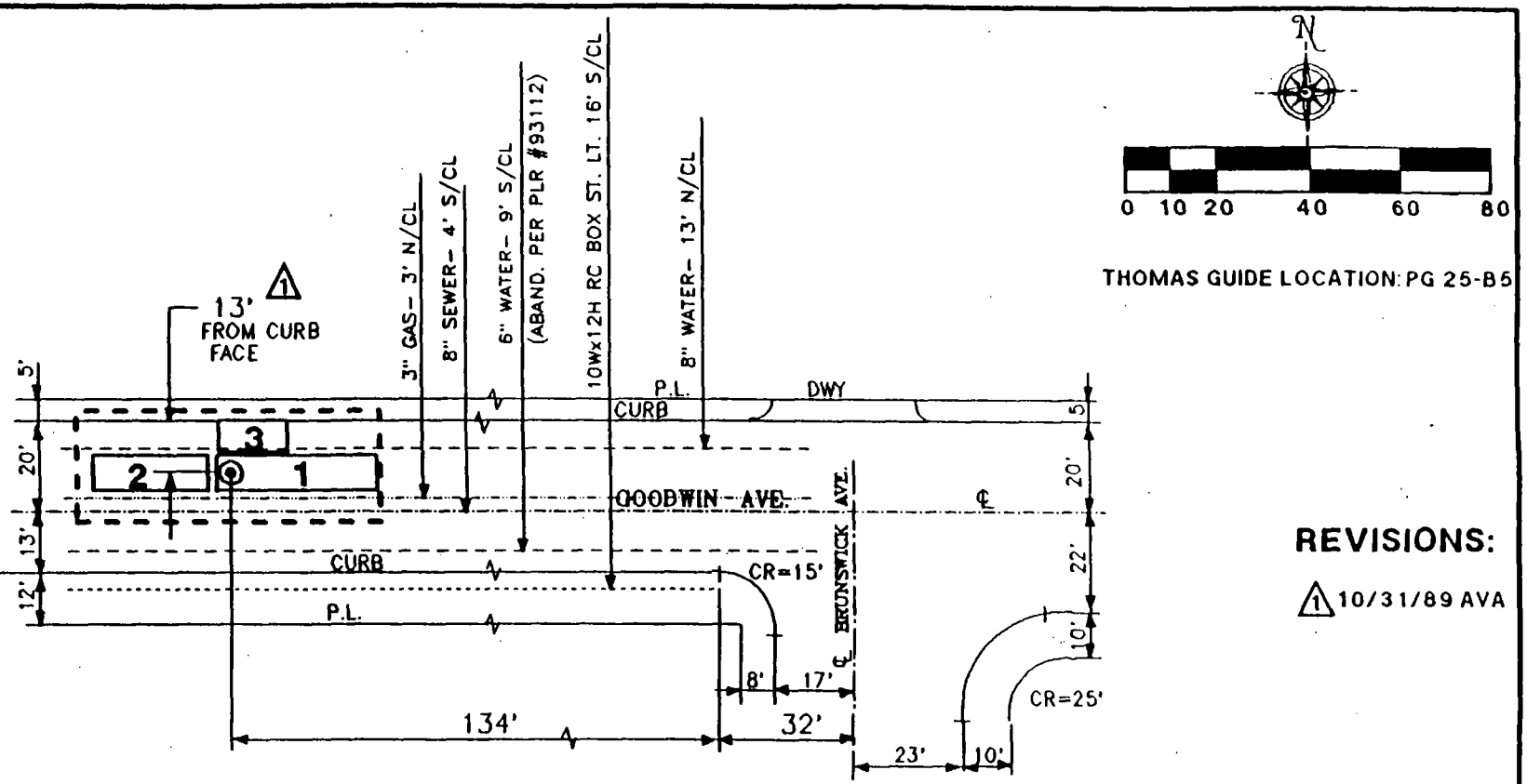
- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.
PO-VPB-01

AVA 09/89



REVISIONS:

1 10/31/89 AVA

- BORING LOCATION
- EXCLUSION ZONE
- 1 DRILL RIG (8 ft. x 35 ft.)
- 2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)
- 3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

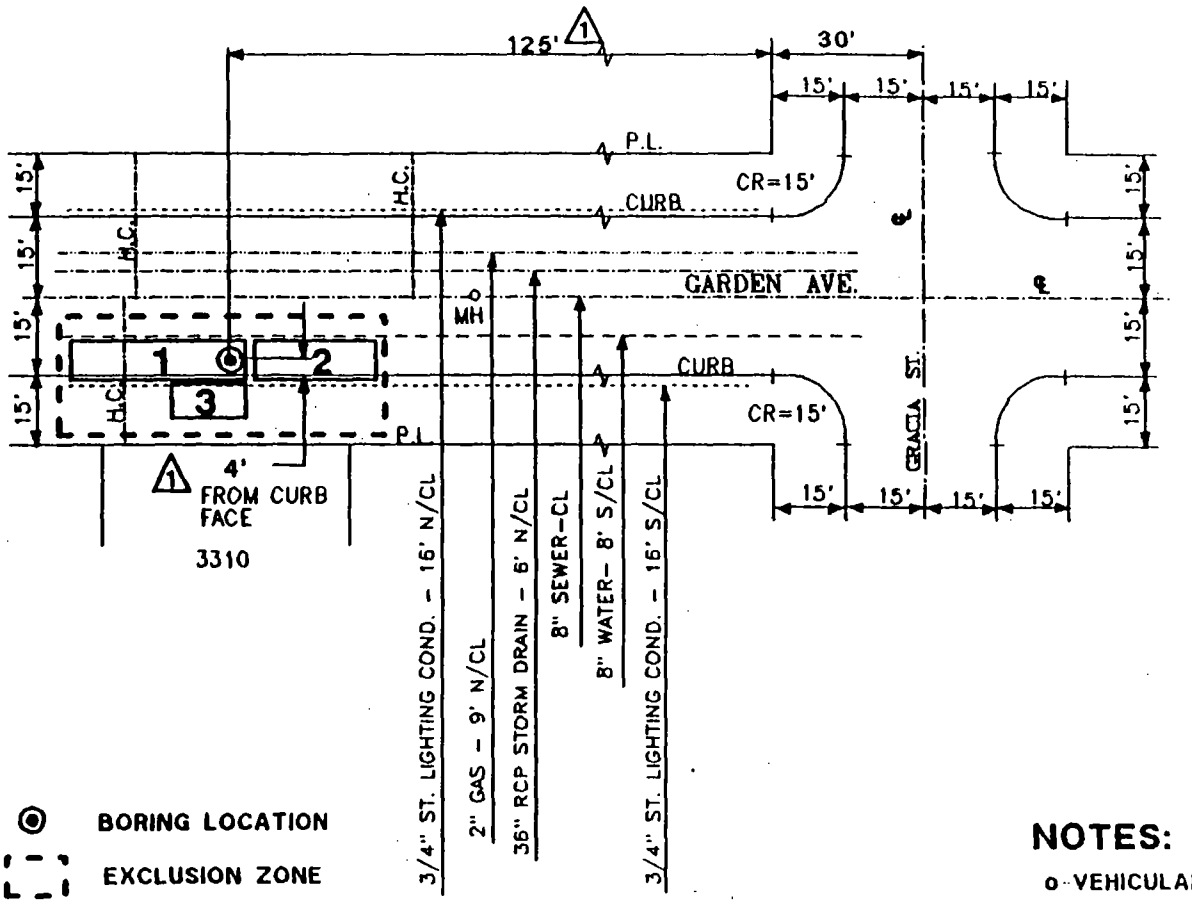
- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

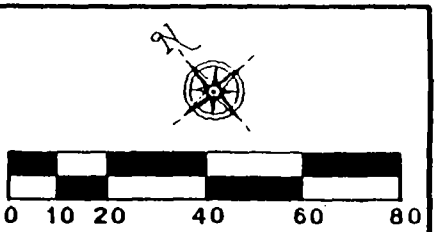
L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.
PO-VPB-02

AVA 09/89





THOMAS GUIDE LOCATION: PG 35-C2

REVISIONS:

1 10/31/89 AVA

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

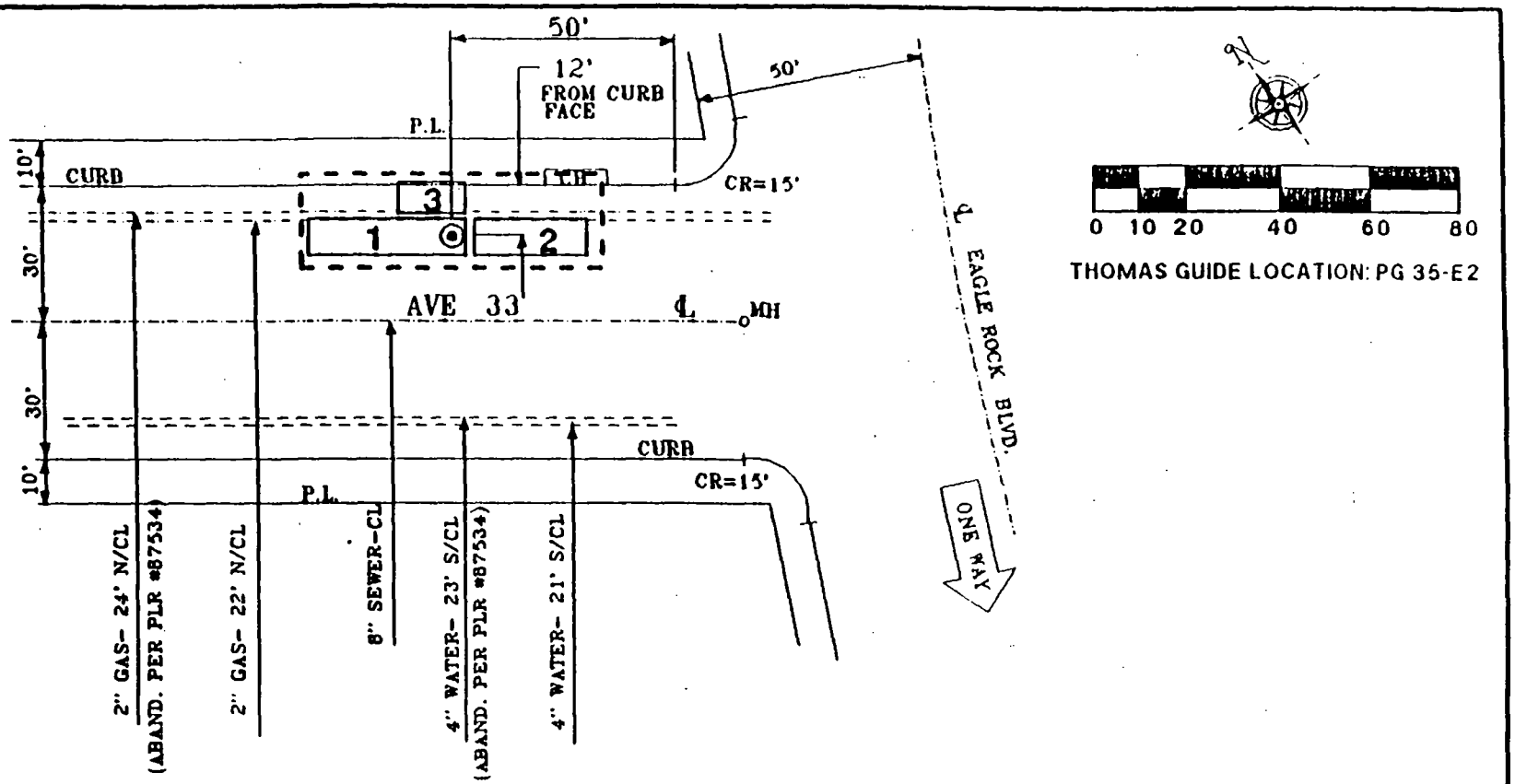
PREPARED BY:

SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.

PO-VPB-03

AVA 09/89



THOMAS GUIDE LOCATION: PG 35-E2

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

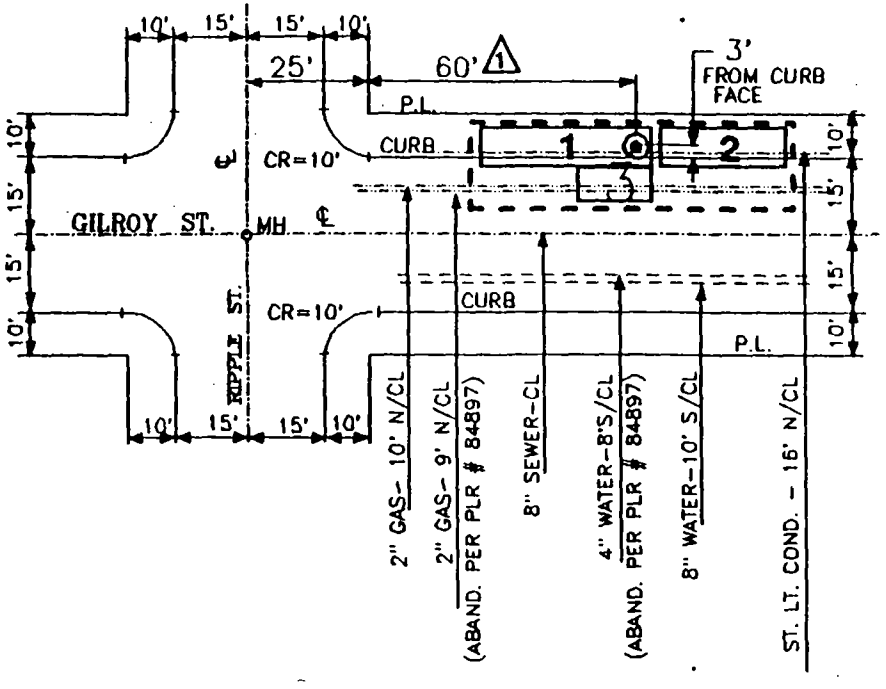
- o VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- o A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

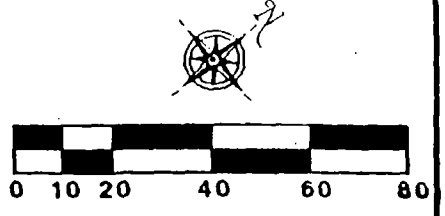
L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

DRAWING NO.
PO-VPB-04

AVA 05/89





THOMAS GUIDE LOCATION: PG 35-D2

REVISIONS:

1 10/31/89 AVA

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

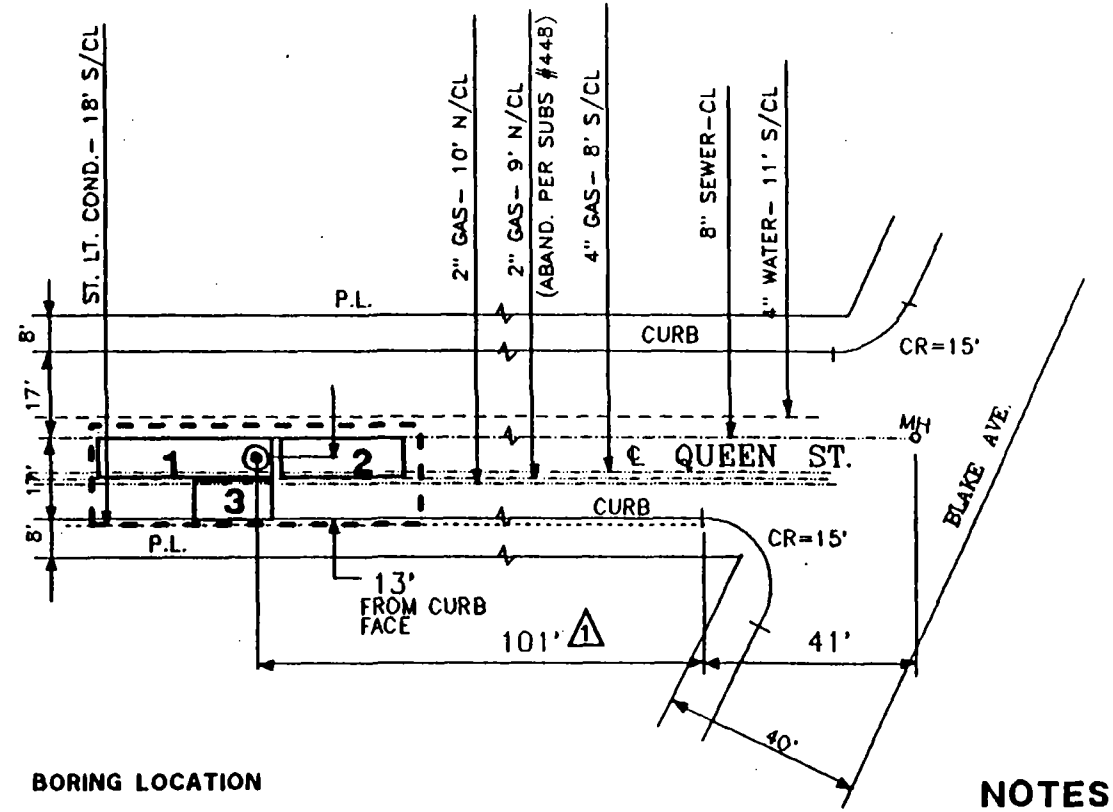
PREPARED BY:

SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.

PO-VPB-05

AVA 09/89



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THOMAS GUIDE LOCATION: PG 35-D3

REVISIONS:

1 10/31/89 AVA

◉ BORING LOCATION

ENCLOSURE ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

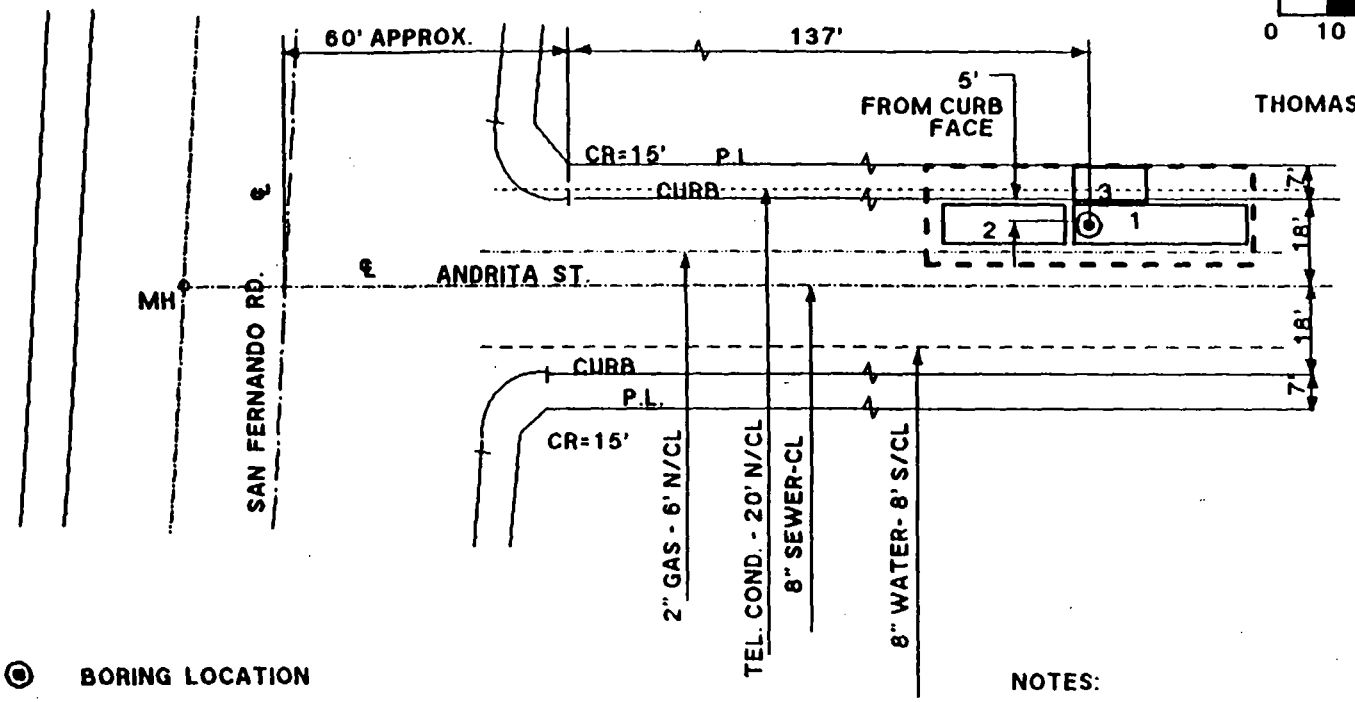
PREPARED BY:

SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.

PO-VPB-06

AVA 09/89



THOMAS GUIDE LOCATION: PG 35-D1

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

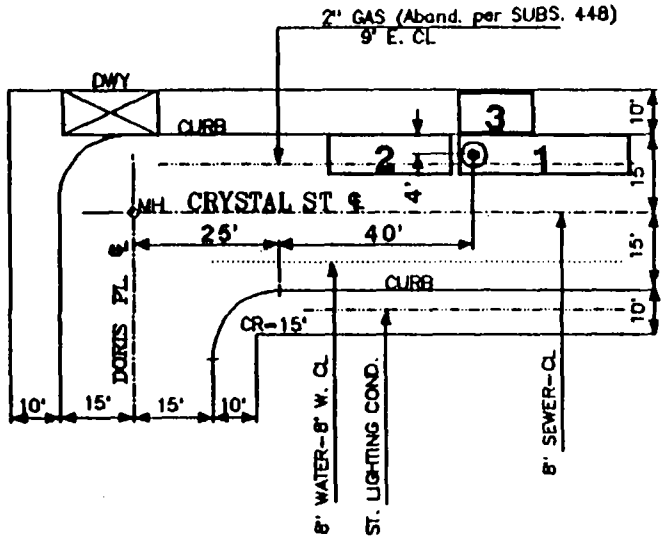
- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

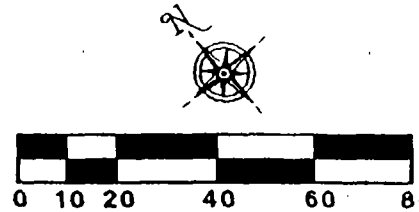
L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.
PO-VPB-07

AVA 06/90





THOMAS GUIDE LOCATION: PG 35-E4

◎ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

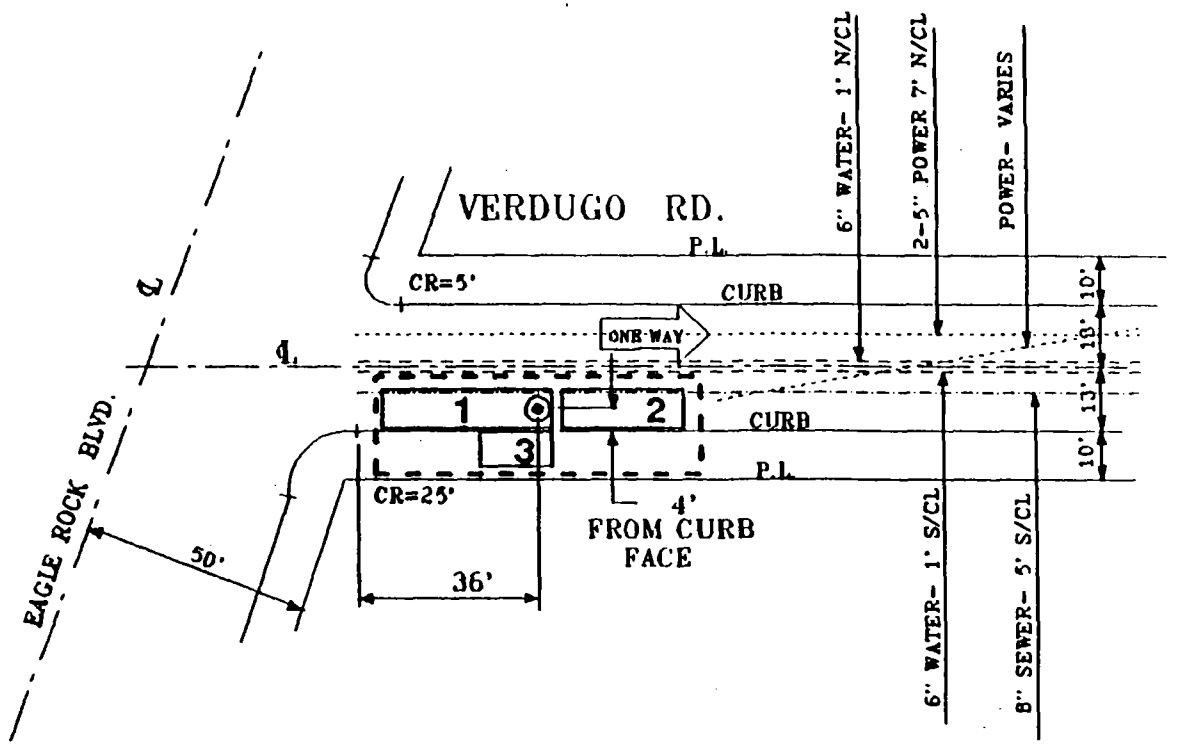
- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

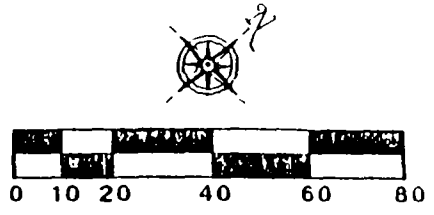
L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

DRAWING NO.
PO-VPB-08

AVA 09/89





THOMAS GUIDE LOCATION: PG 35-E3

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

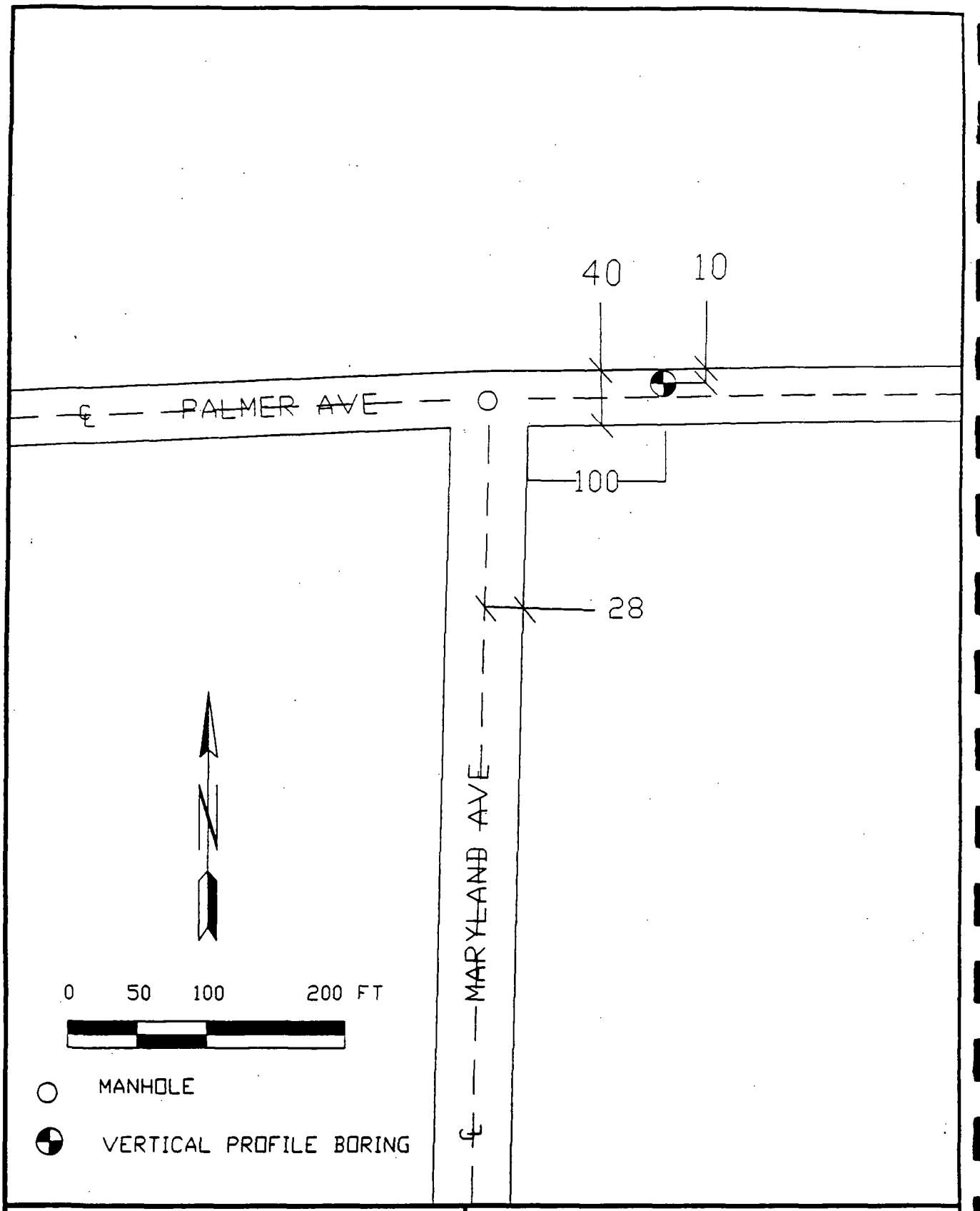
- VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

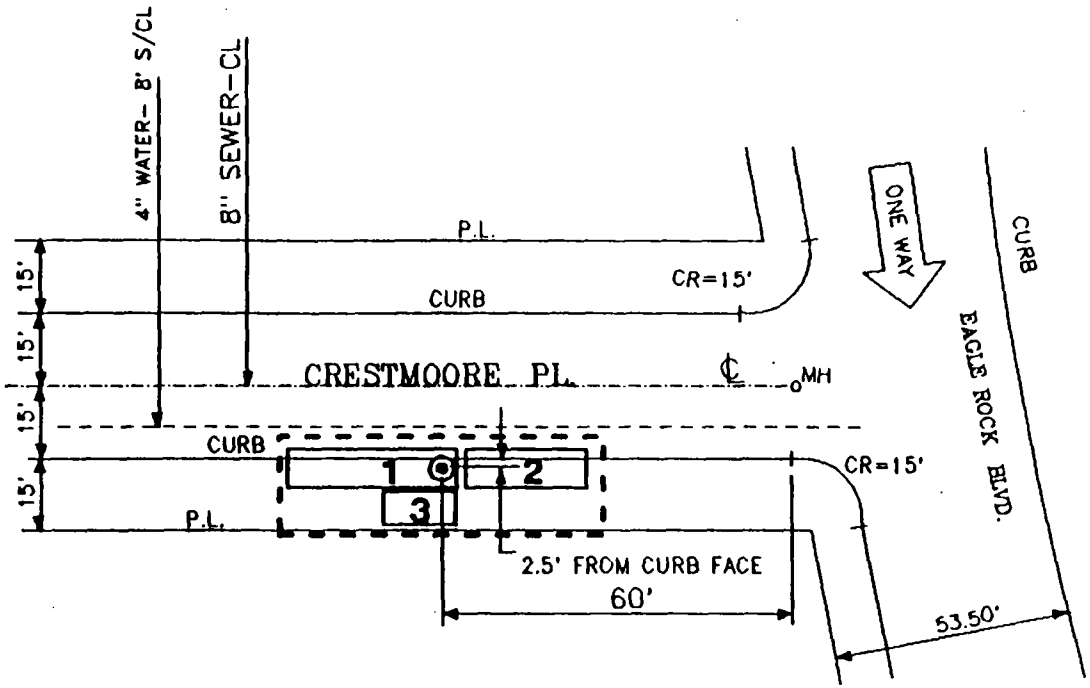
PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEP'T OF WATER & POWER

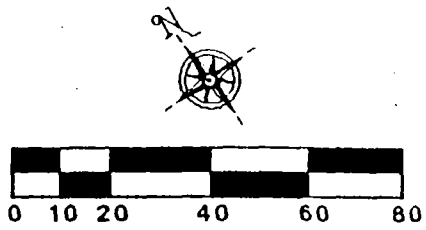
DRAWING NO.
PO-VPB-09

AVA 09/89



L.A.D.W.P. SAN FERNANDO VALLEY R.I. POLLOCK NPL SITE	VERTICAL PROFILE BORINGS LOCATION OF BORING PO-VPB-10





THOMAS GUIDE LOCATION: PG 35-E1

REVISIONS:

1 10/31/89 AVA

◉ BORING LOCATION

EXCLUSION ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

- o VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- o A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
POLLOCK NPL SITE

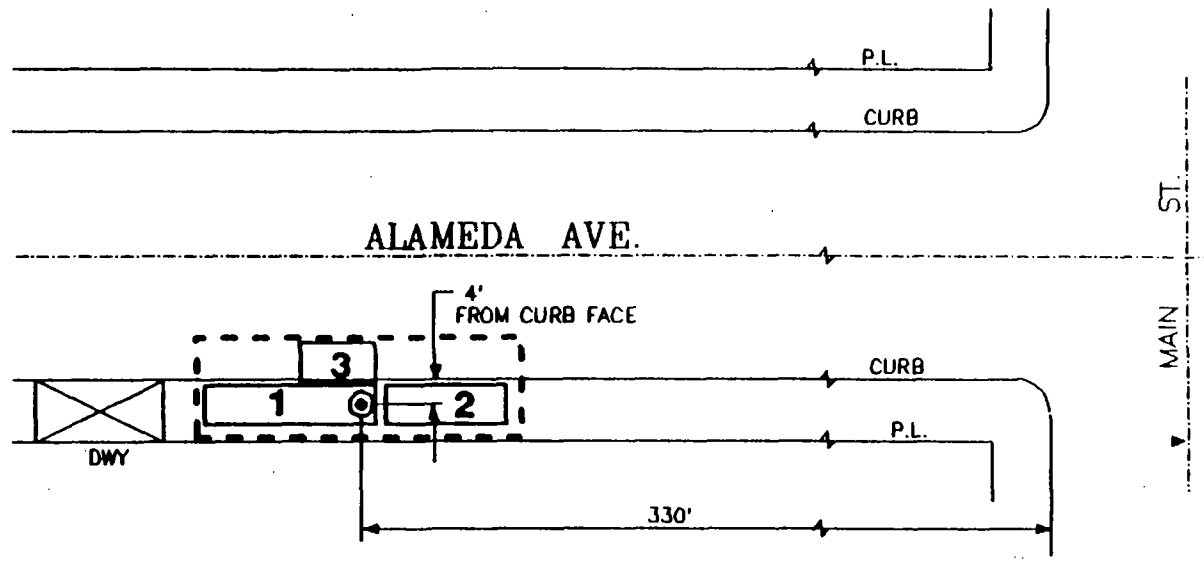
PREPARED BY:

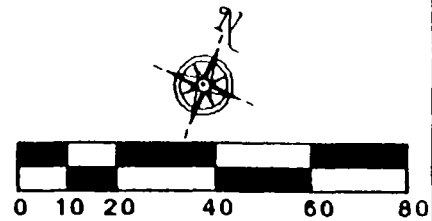
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

DRAWING NO.

PO-VPB-11

AVA 09/89





THOMAS GUIDE LOCATION: PG 24-D2
CITY OF LOS ANGELES

◉ BORING LOCATION

ENCLOSURE ZONE

1 DRILL RIG (8 ft. x 35 ft.)

2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)

3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

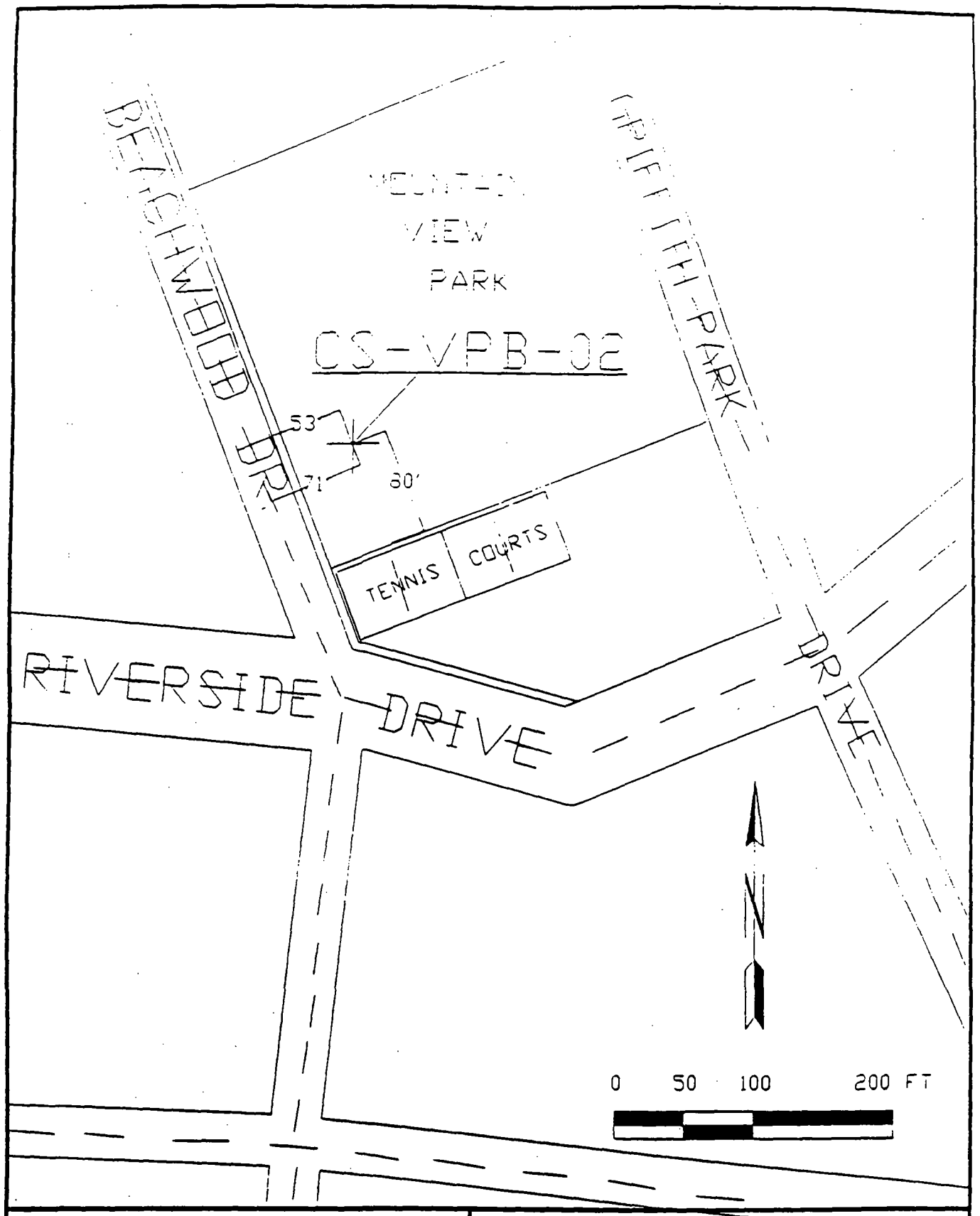
- o VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- o A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

L. A. D. W. P.
VERTICAL PROFILE BORING LOCATION
CRYSTAL SPRINGS NPL SITE

PREPARED BY:
SUPERFUND GROUP
WATER ENGINEERING DESIGN DIVISION
LOS ANGELES DEPT OF WATER & POWER

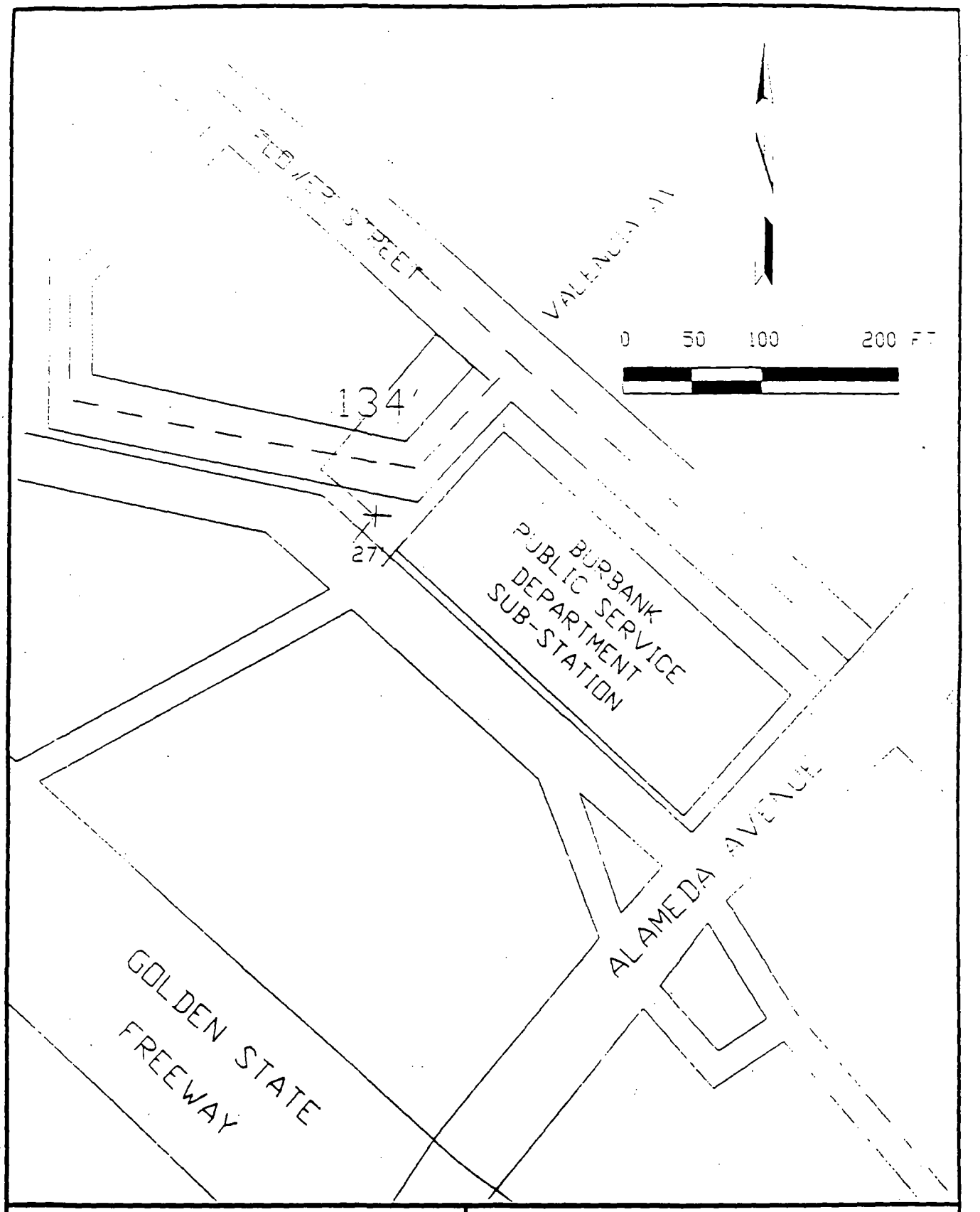
DRAWING NO.
CS-VPB-01

AVA 06/90



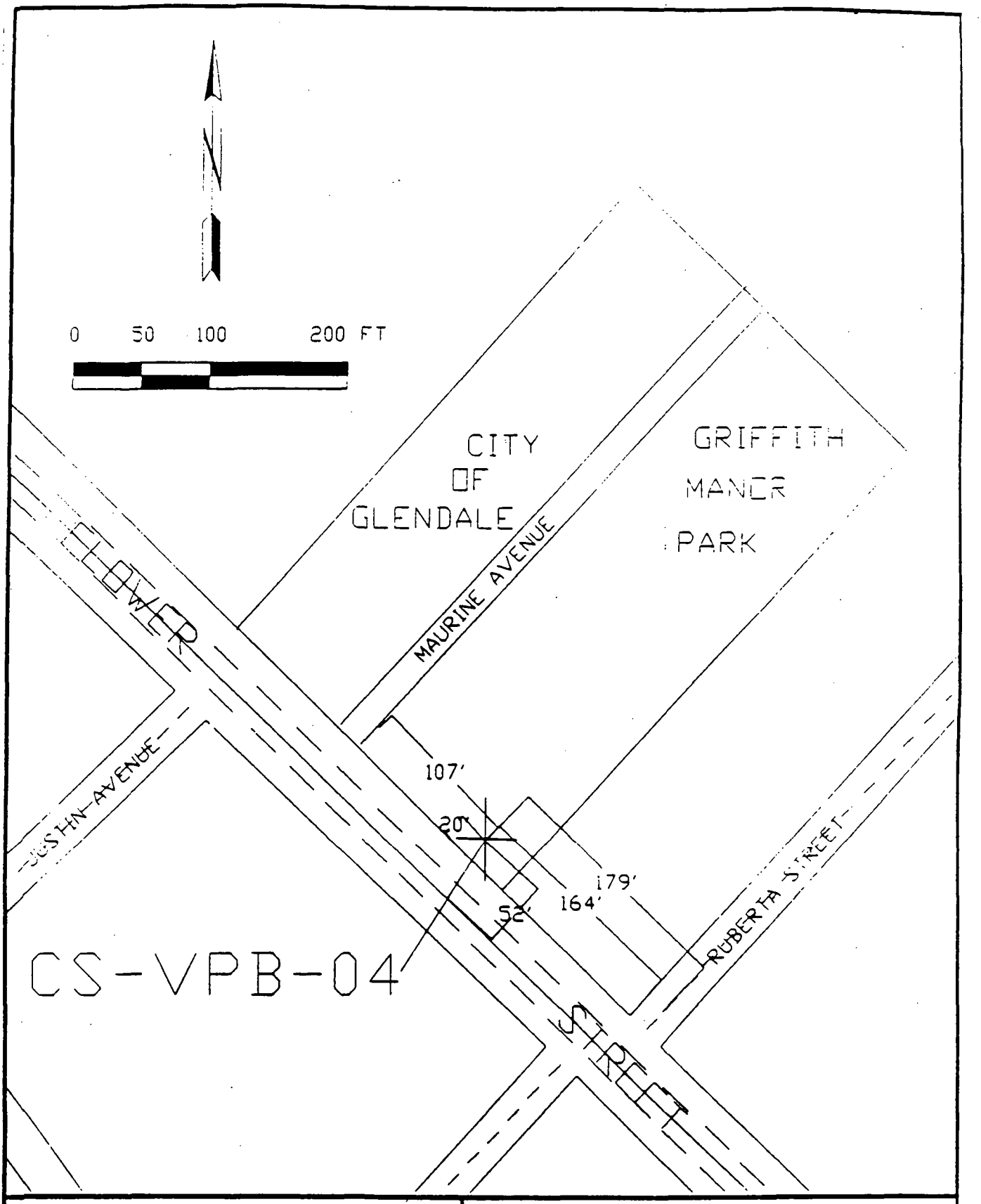
L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
CRYSTAL SPRINGS NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
CS-VPB-02

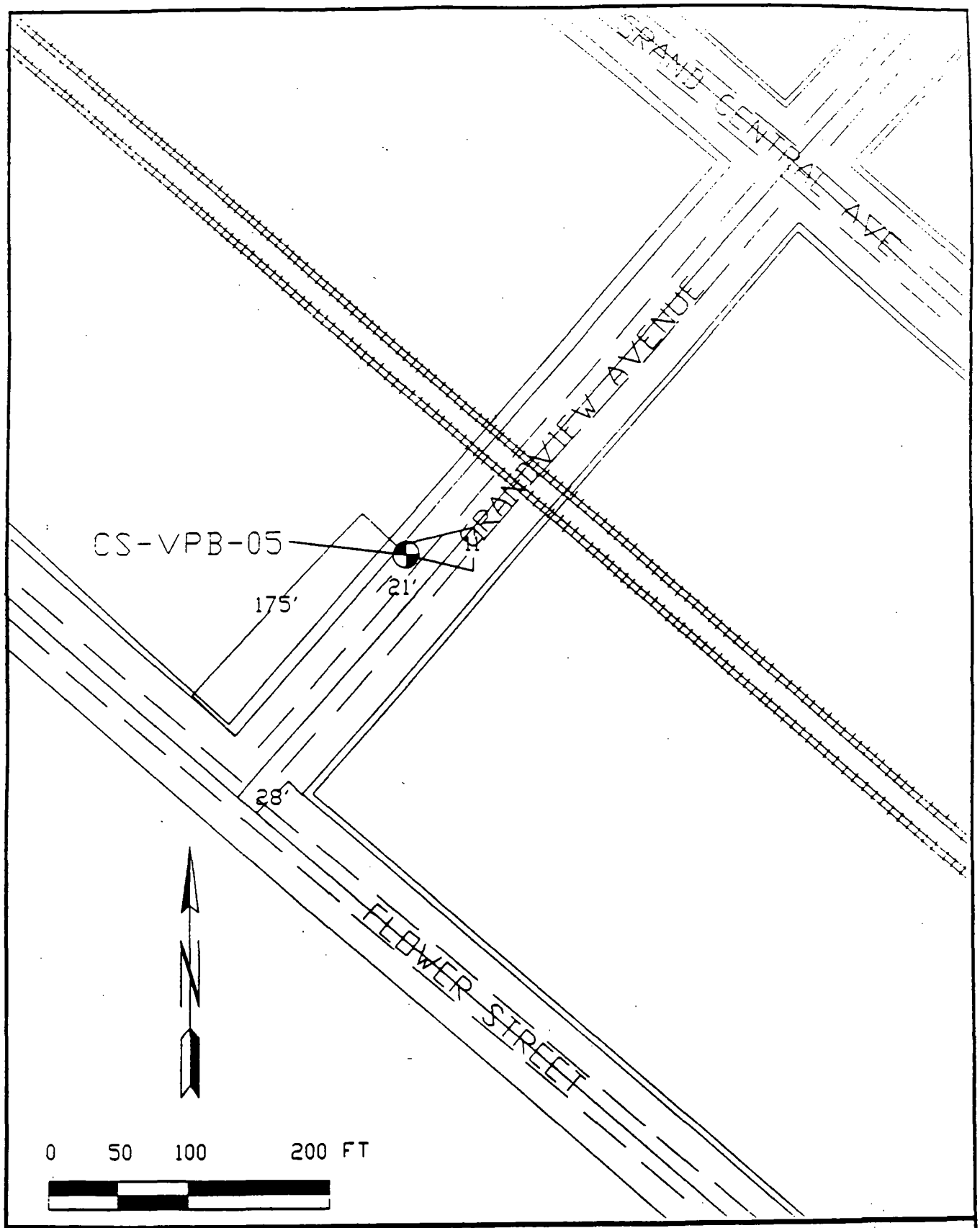


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
CRYSTAL SPRINGS NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
CS-VPB-03

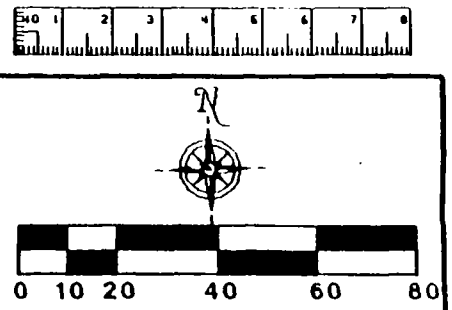


L.A.D.W.P. SAN FERNANDO VALLEY R.I. CRYSTAL SPRINGS NPL SITE	VERTICAL PROFILE BORINGS PROPOSED LOCATION OF BORING CS-VPB-04

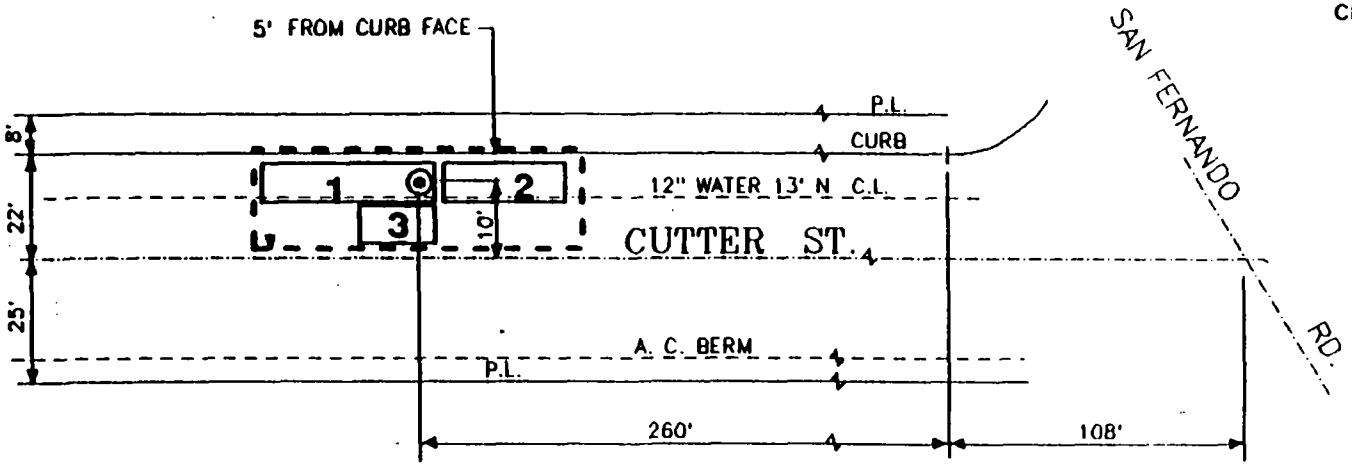


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
CRYSTAL SPRINGS NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
CS-VPB-05



THOMAS GUIDE LOCATION: PG 25-B3
CITY OF LOS ANGELES



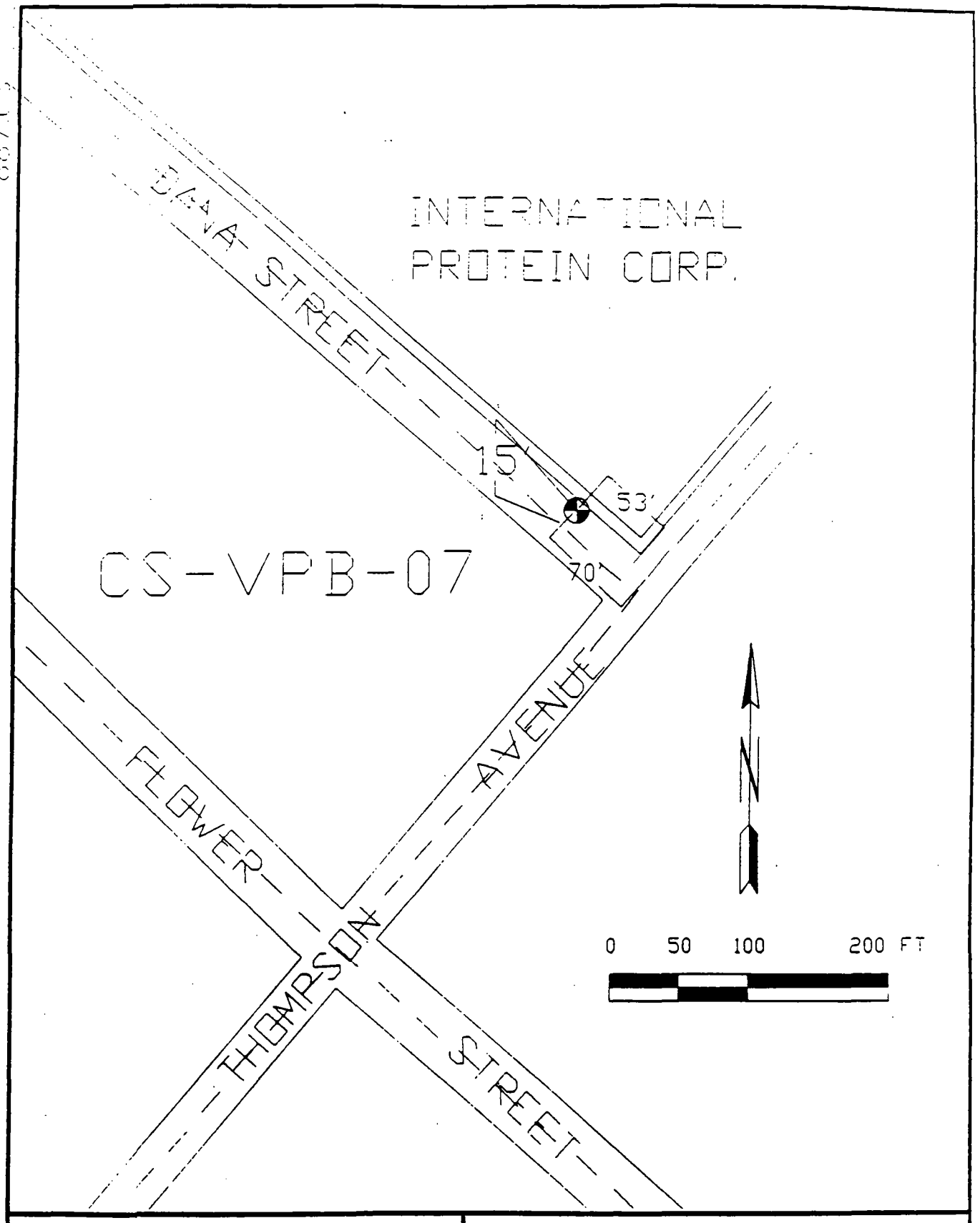
- BORING LOCATION
- ENCLOSURE ZONE
- 1 DRILL RIG (8 ft. x 35 ft.)
- 2 SERVICE/PIPE TRUCK (8 ft. x 25 ft.)
- 3 WASTE BIN, SEALABLE (7 ft. x 15 ft.)

NOTES:

- o VEHICULAR INGRESS/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- o A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION AND OTHER SUBSTRUCTURES.

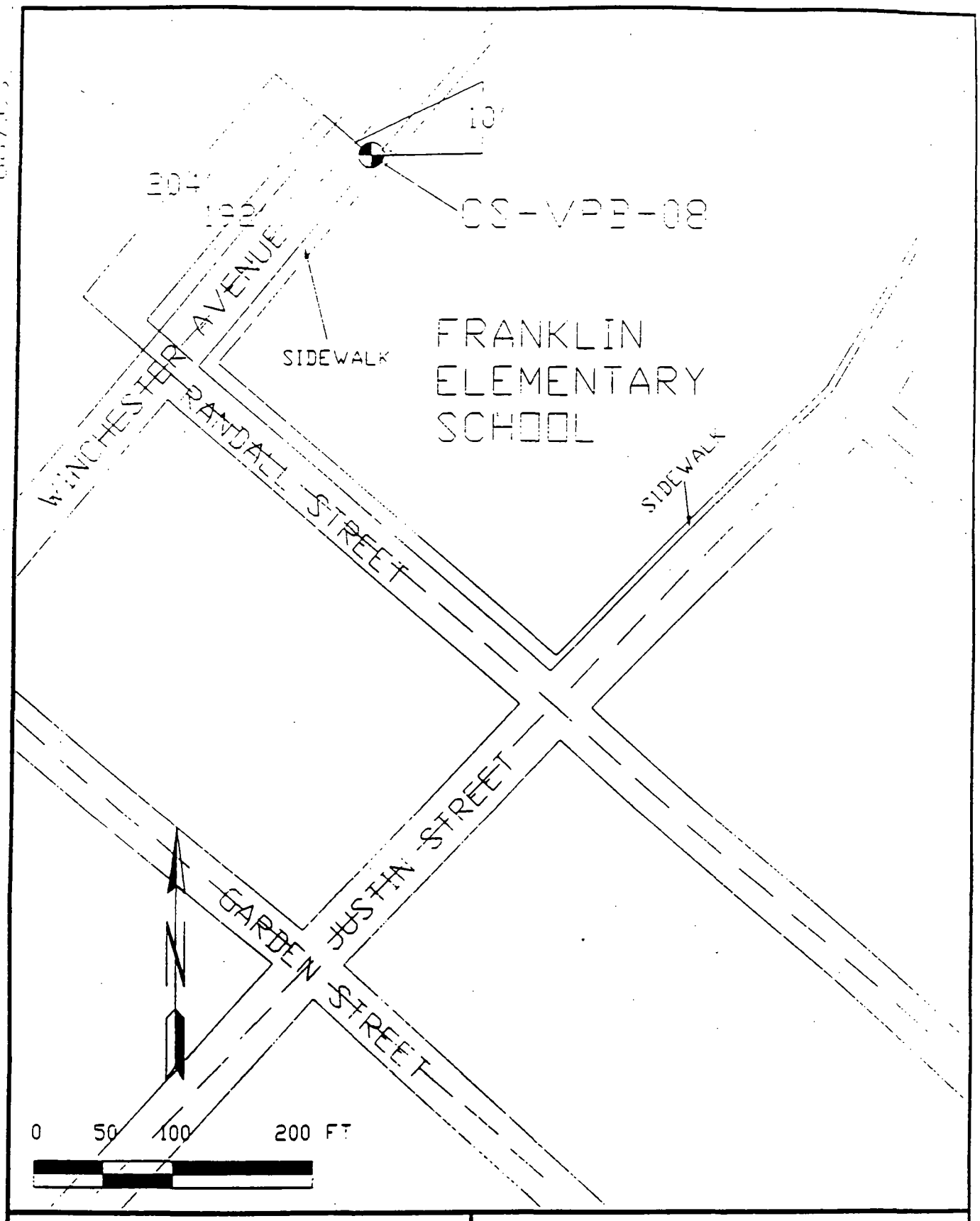
L. A. D. W. P. **VERTICAL PROFILE BORING LOCATION** **CRYSTAL SPRINGS NPL SITE**	PREPARED BY: SUPERFUND GROUP WATER ENGINEERING DESIGN DIVISION LOS ANGELES DEPT OF WATER & POWER	DRAWING NO. **CS-VPB-06**

AVA 06/90

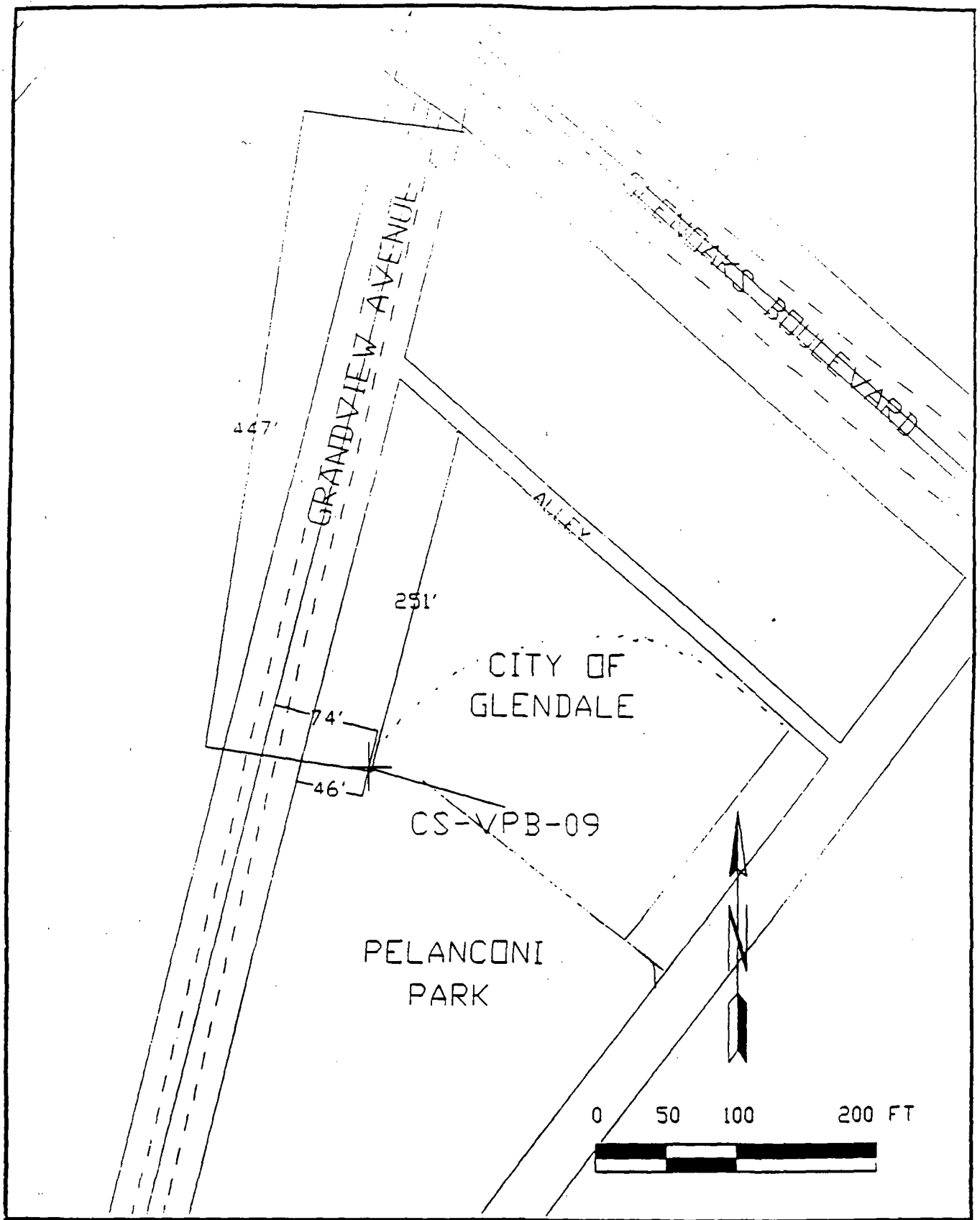


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
CRYSTAL SPRINGS NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
CS-VPB-07

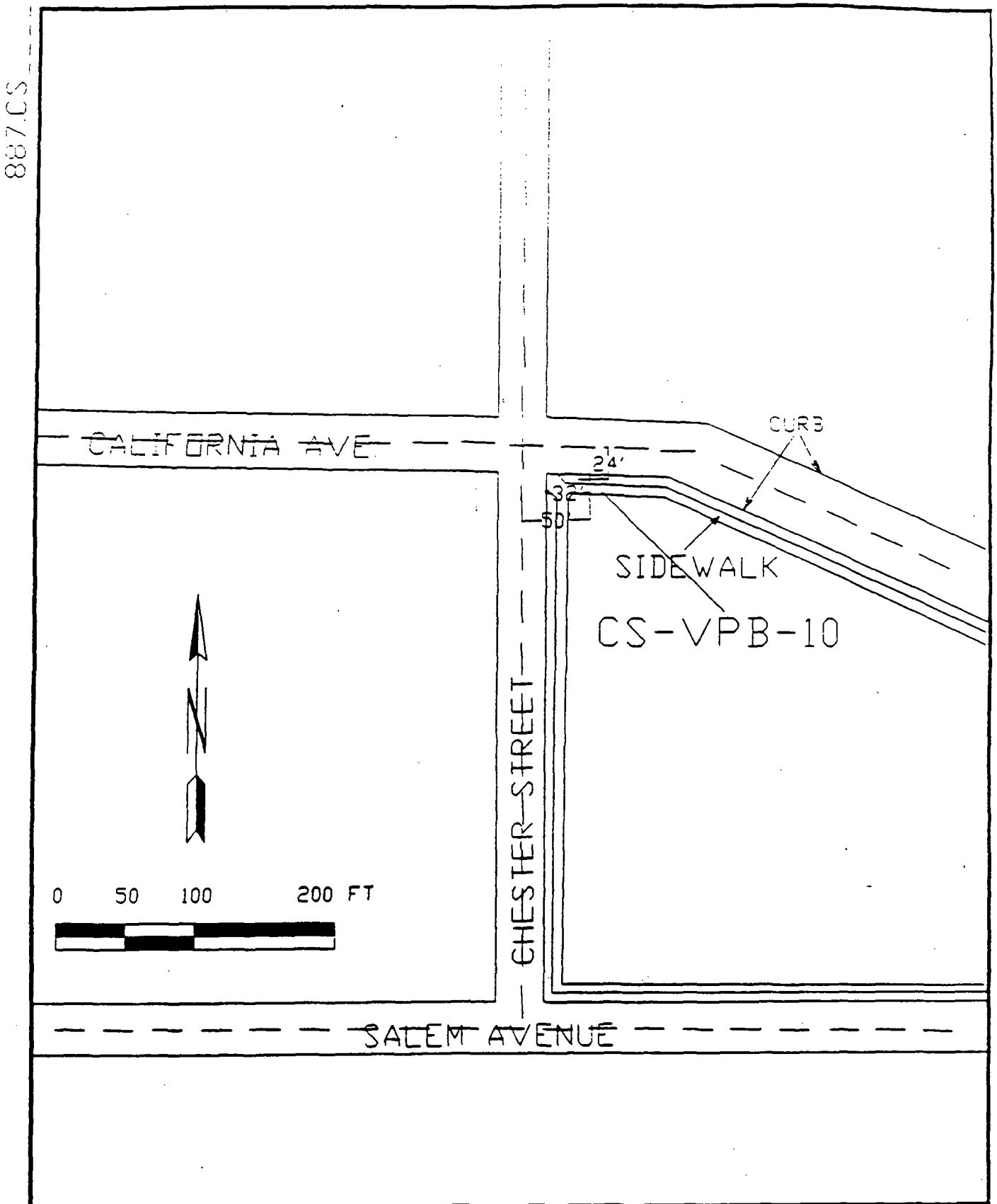


L.A.D.W.P. SAN FERNANDO VALLEY P.I. CRYSTAL SPRINGS NPL SITE	VERTICAL PROFILE BORINGS PROPOSED LOCATION OF BORING CS-VPB-08



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
CRYSTAL SPRINGS NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
CS-VPB-09



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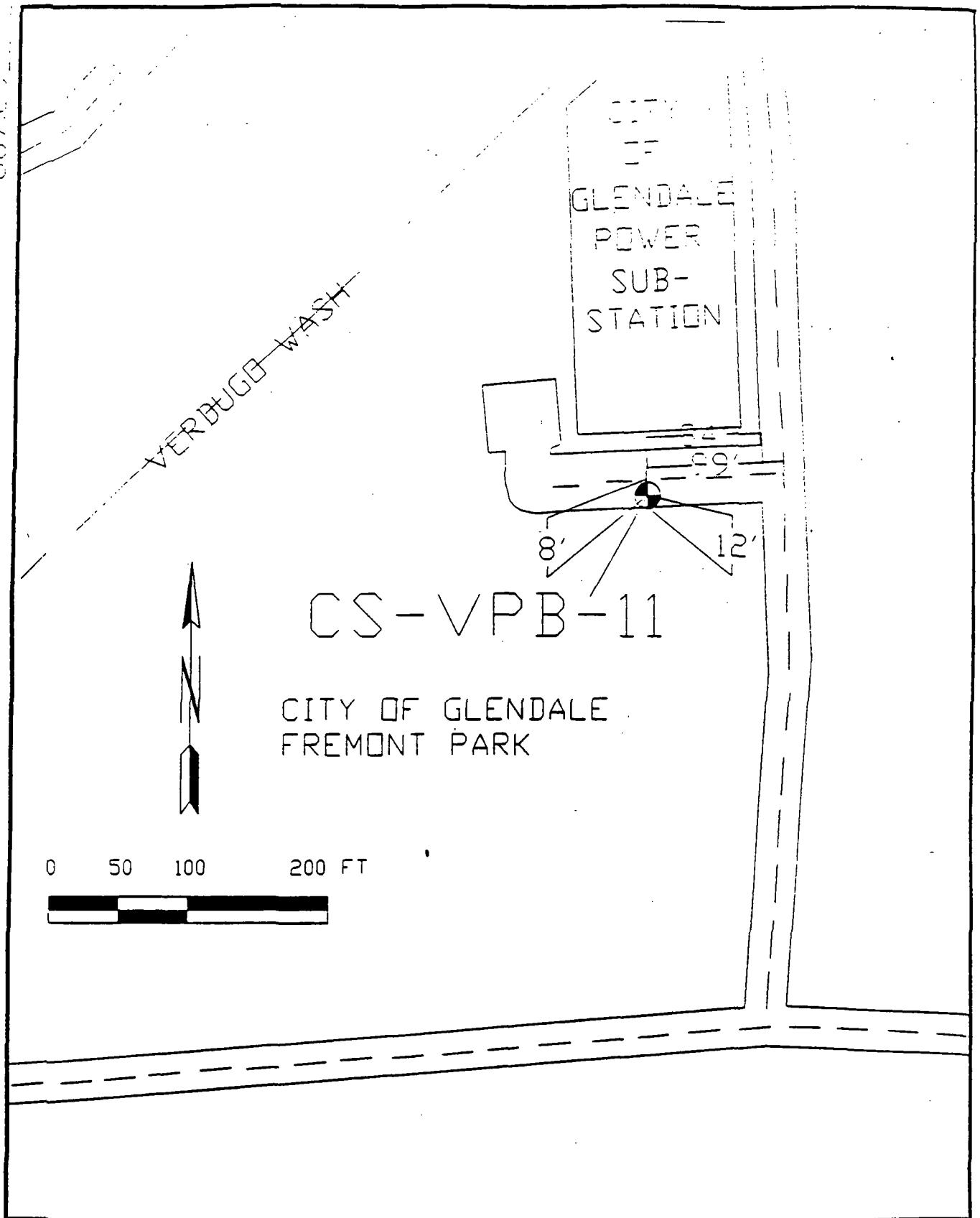
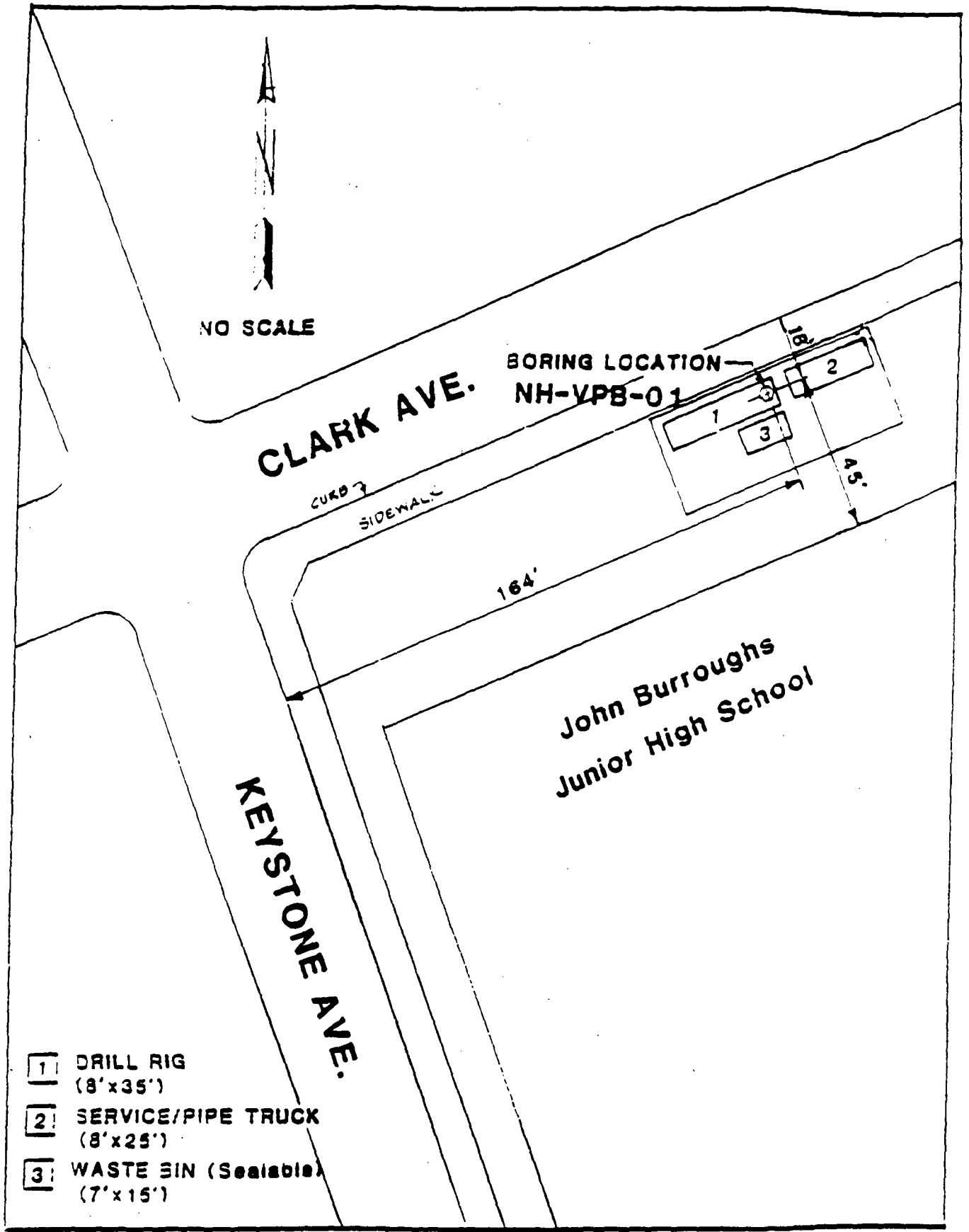
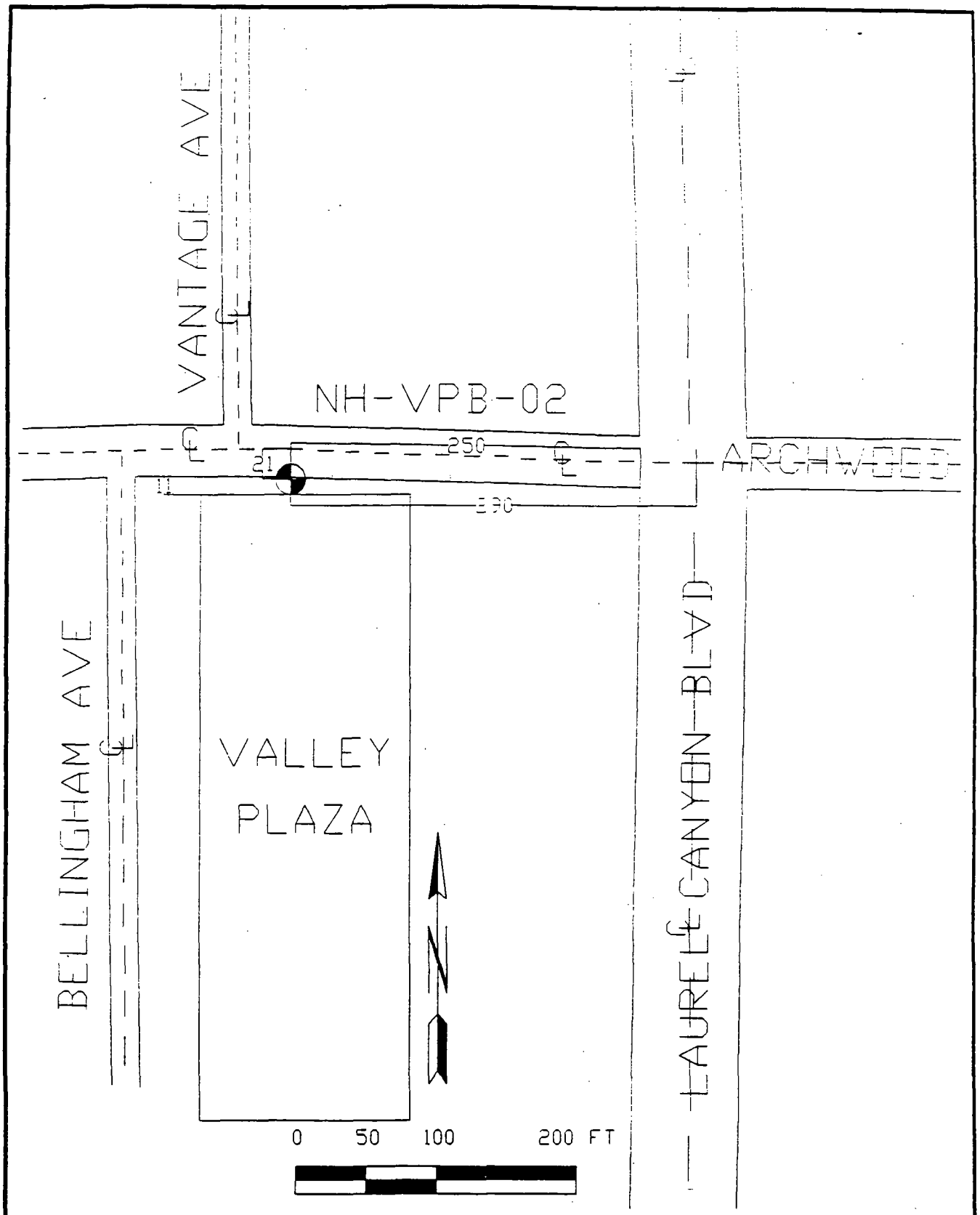


L.A.D.W.P. SAN FERNANDO VALLEY R.I. CRYSTAL SPRINGS NPL SITE	VERTICAL PROFILE BORINGS PROPOSED LOCATION OF BORING CS-VPB-11



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
CRYSTAL SPRINGS NPL SITE

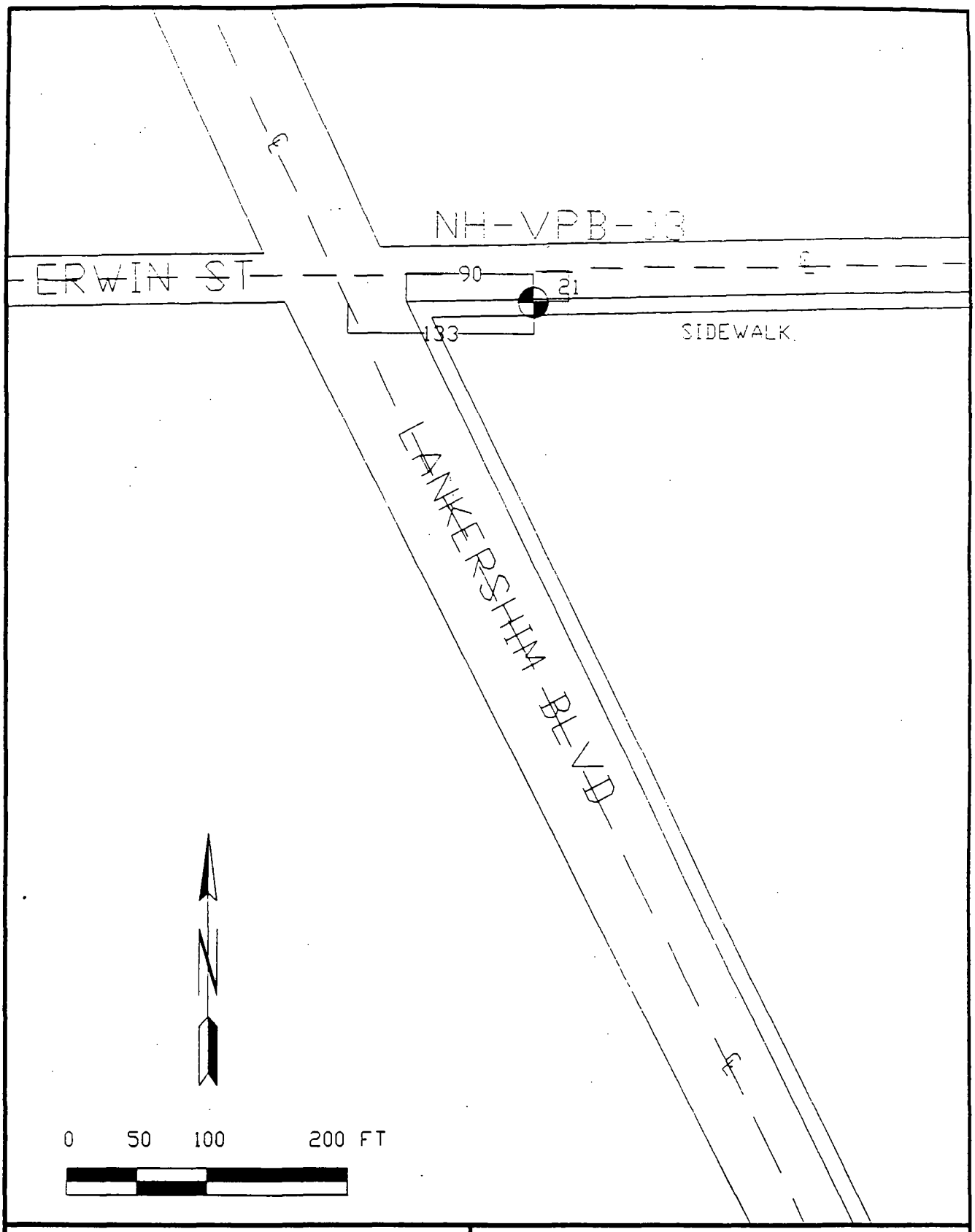
VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-01



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-02

887.NH0007



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE · BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-03

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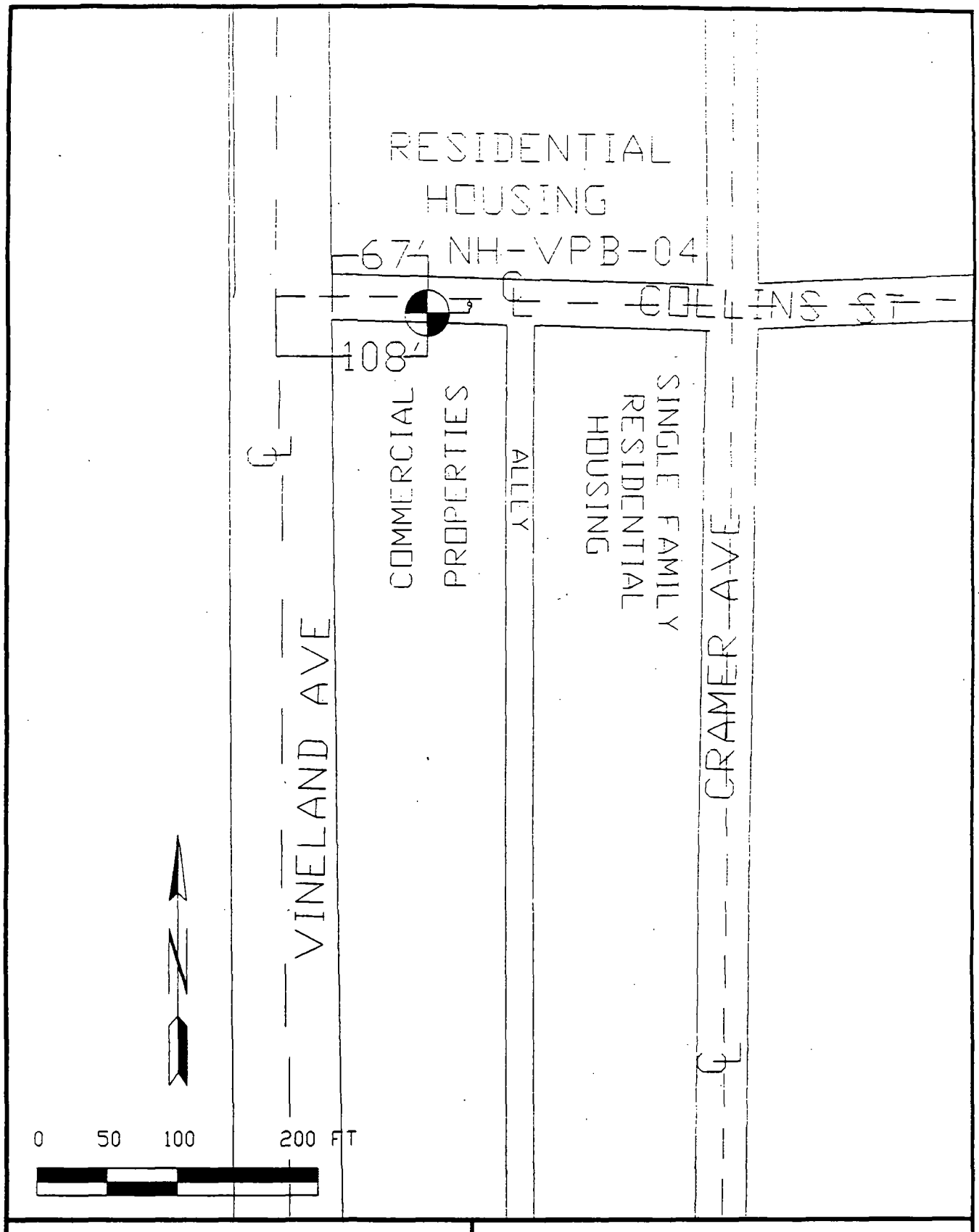
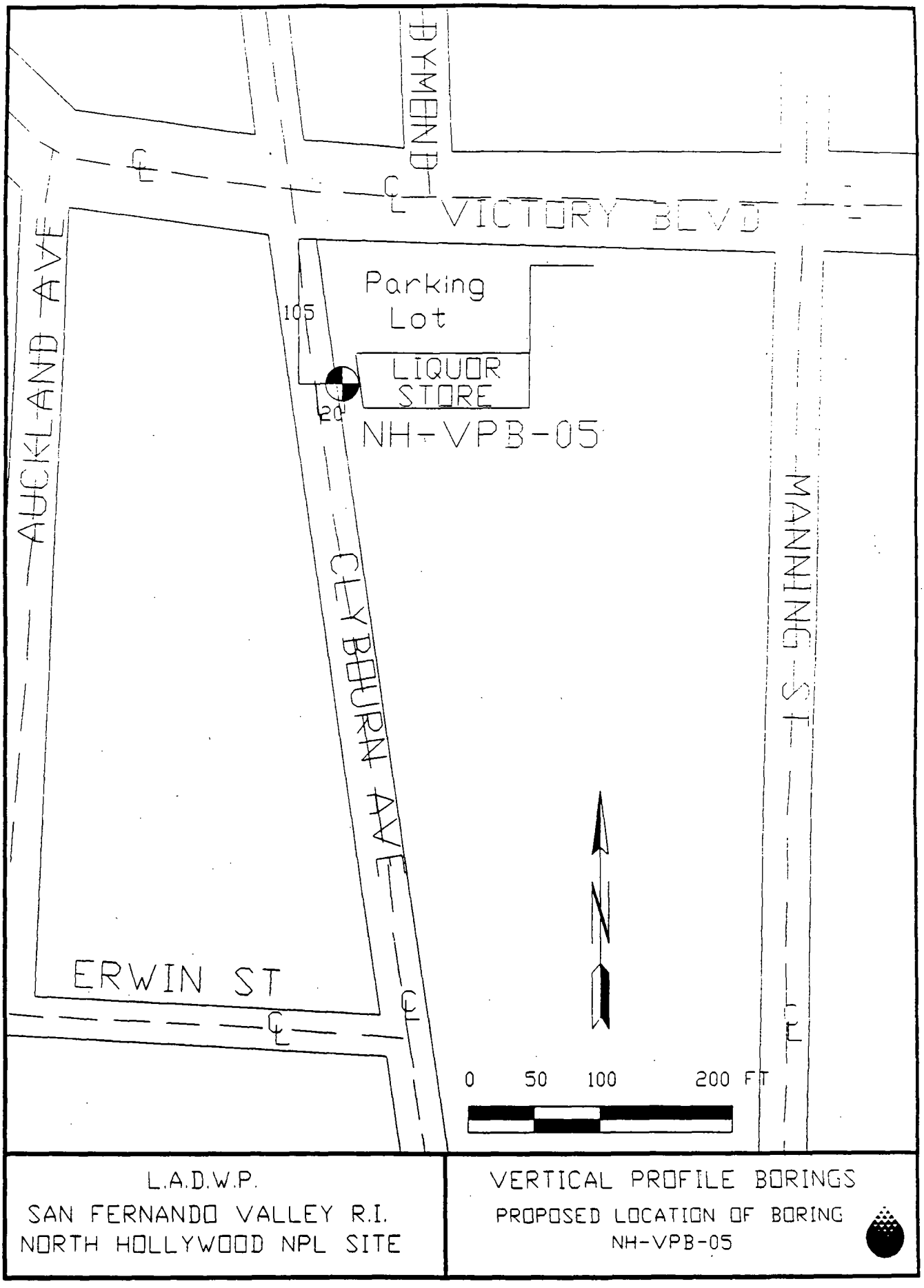


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

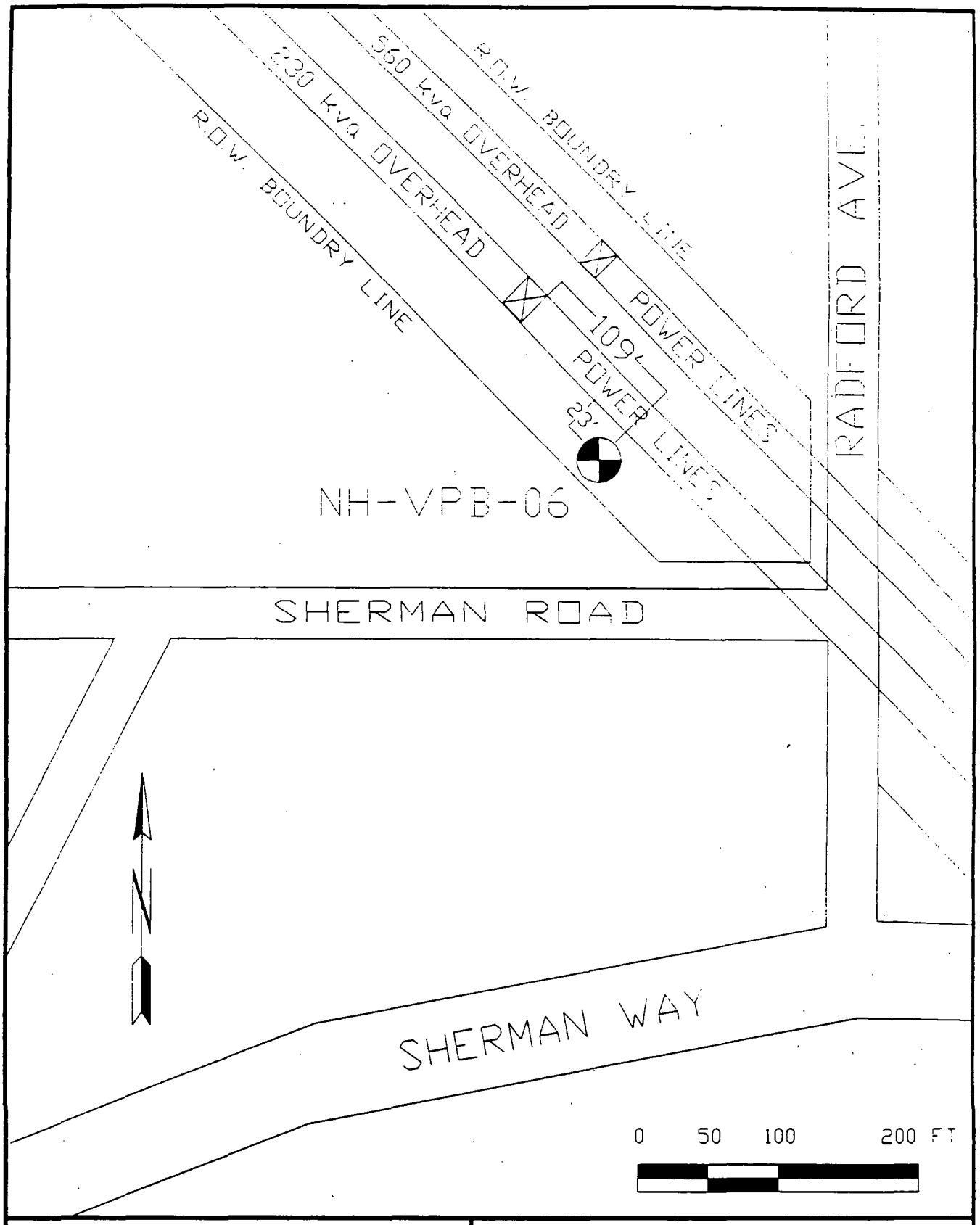
VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-04



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-05

887.NH0010



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-06

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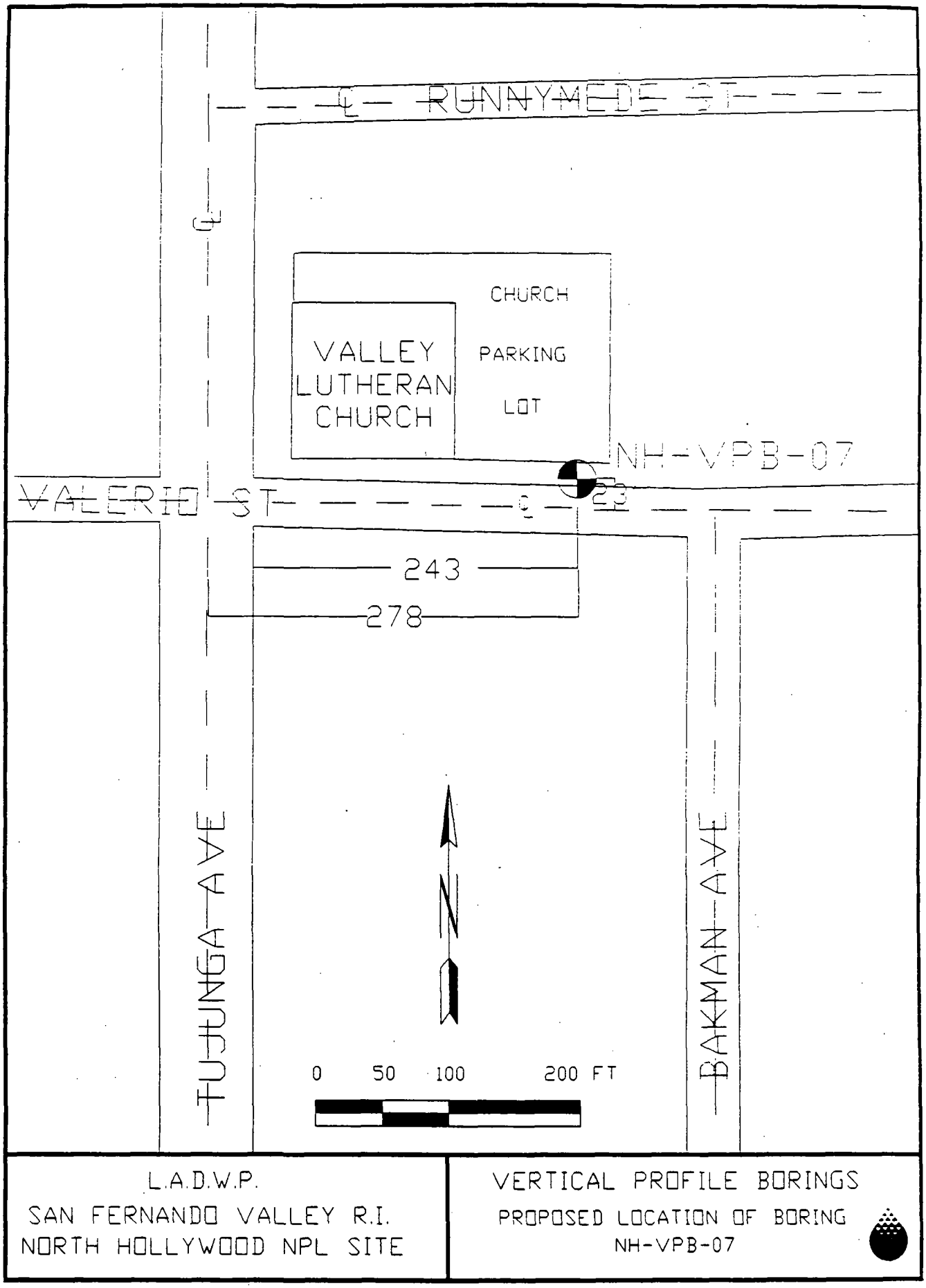
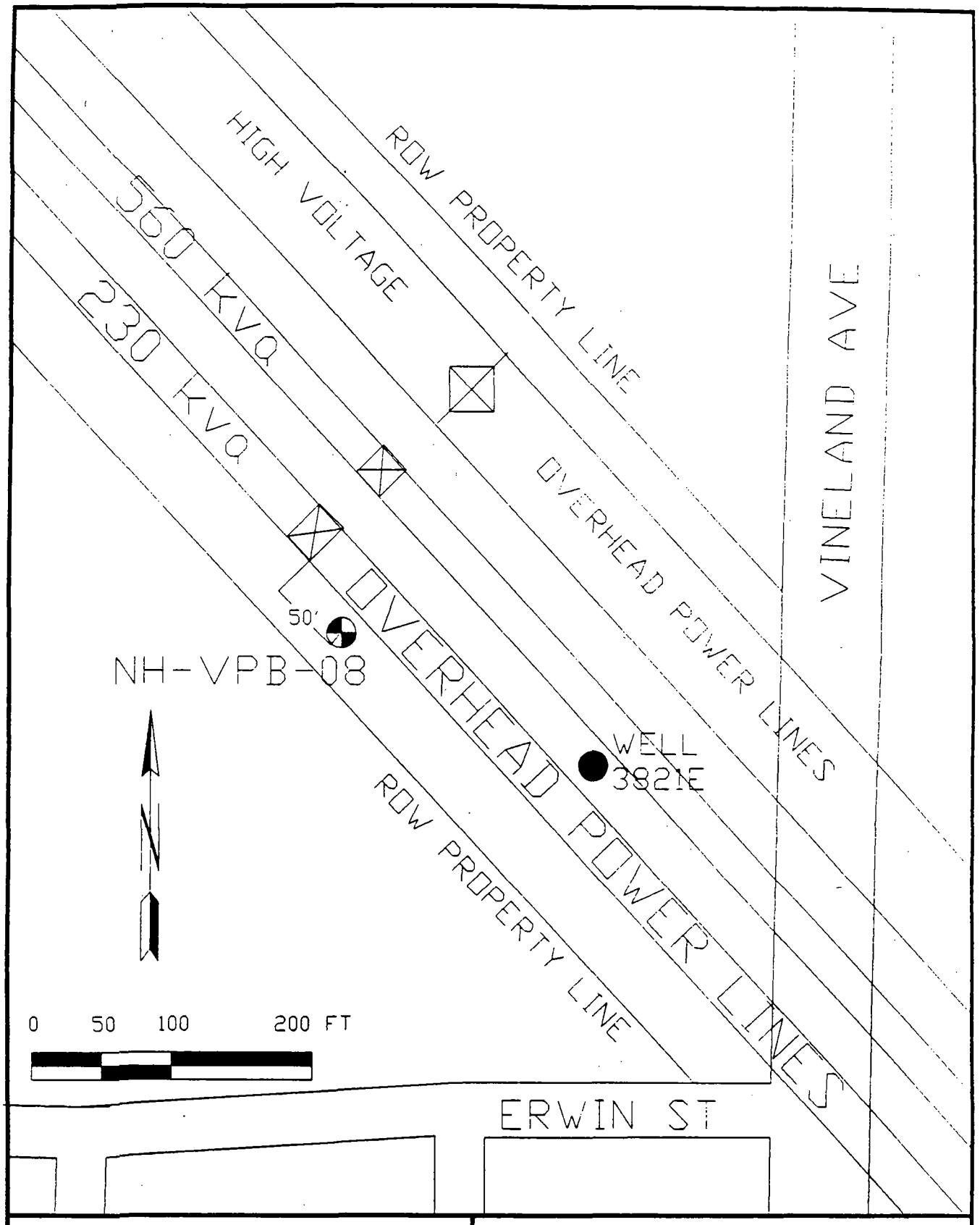


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-07

837.NH0012



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-08

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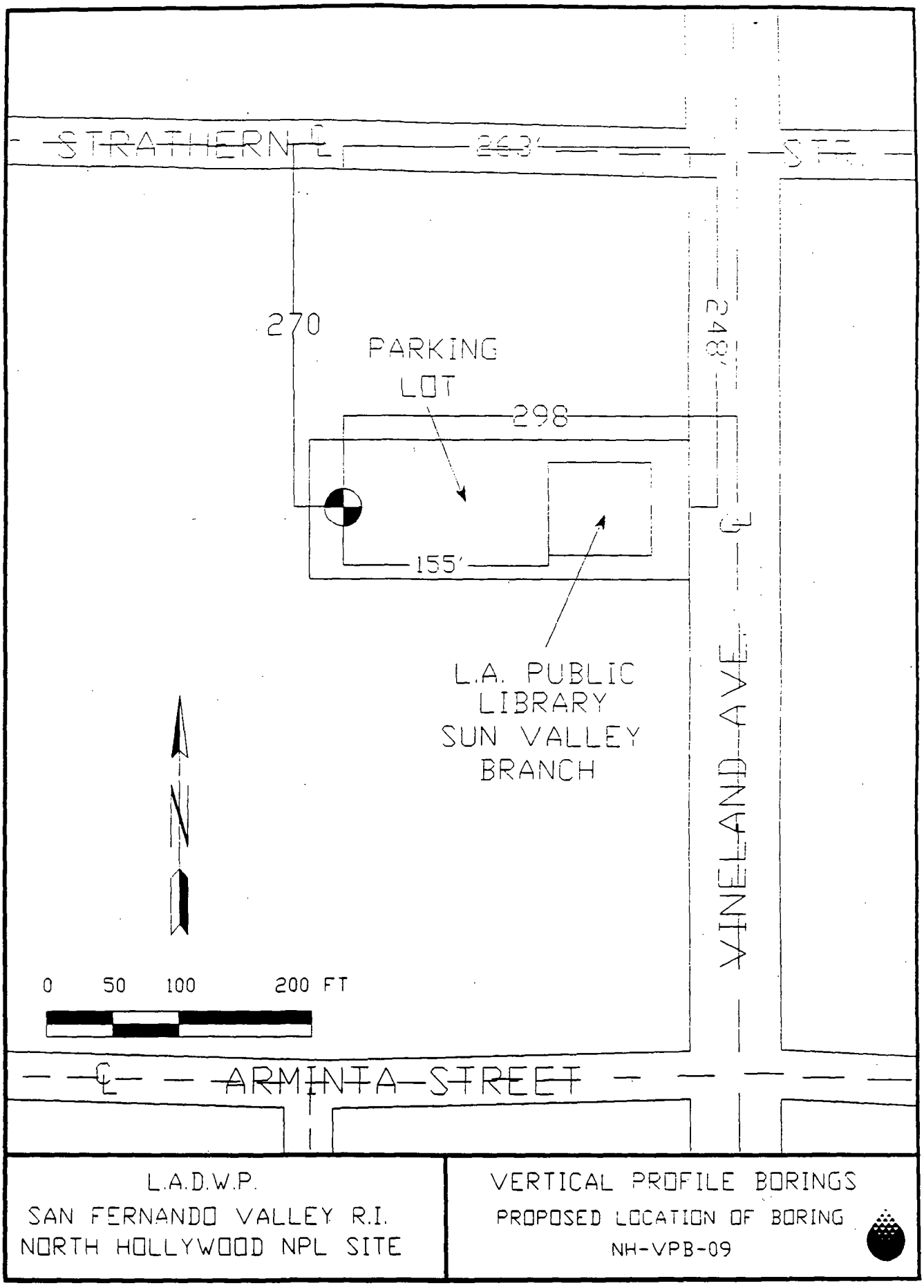
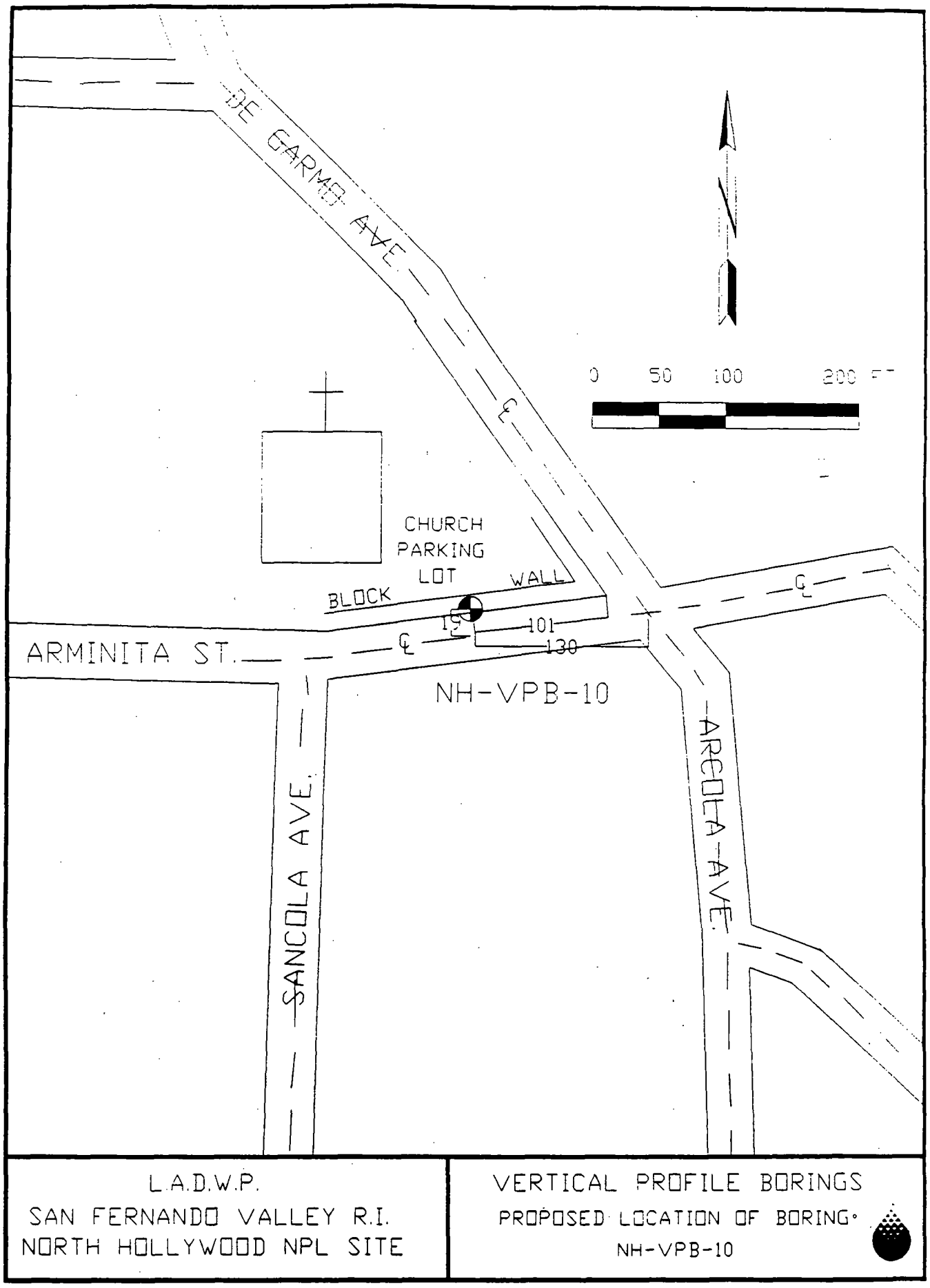


L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

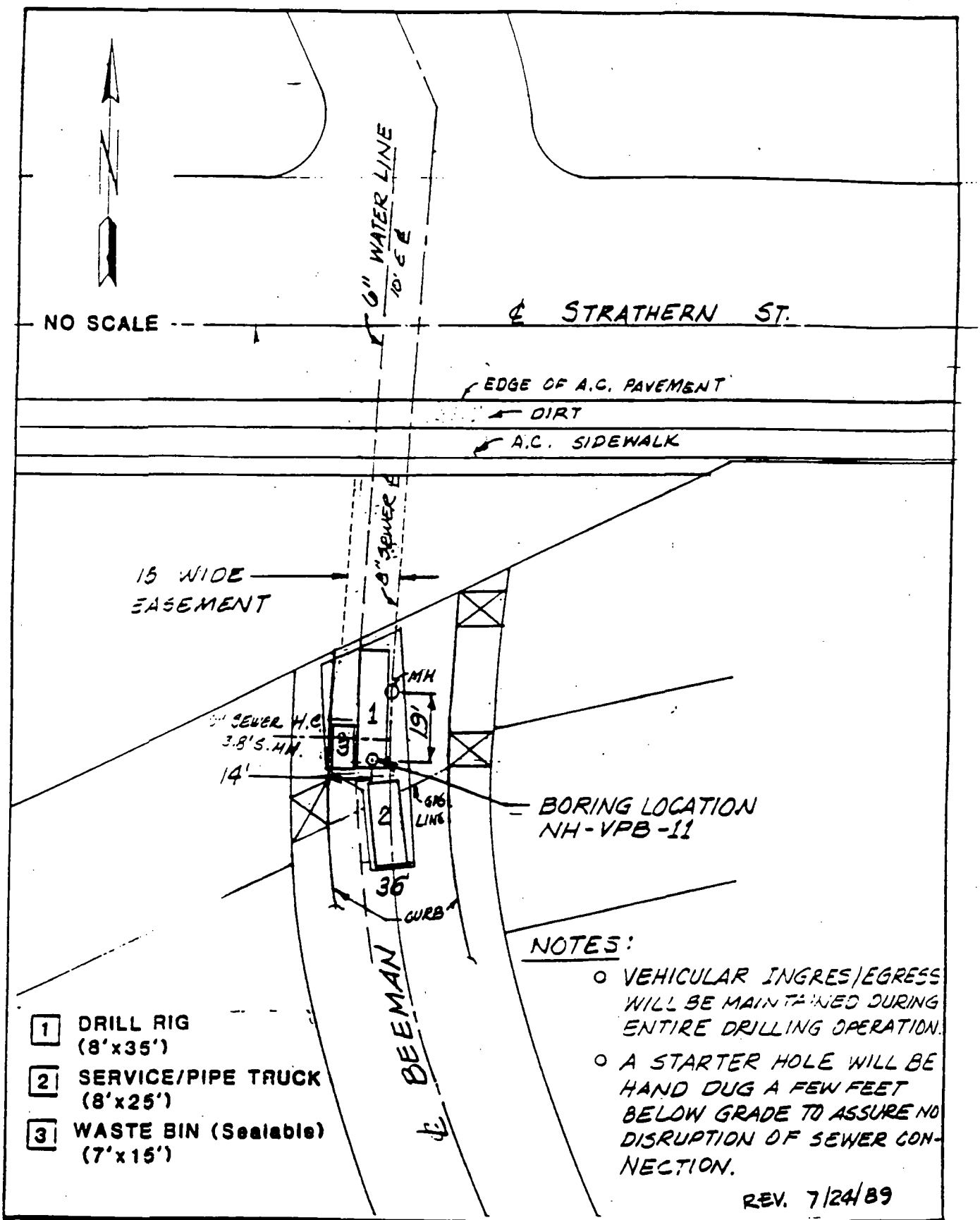
VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-09

887.NH0015



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-10



NOTES:

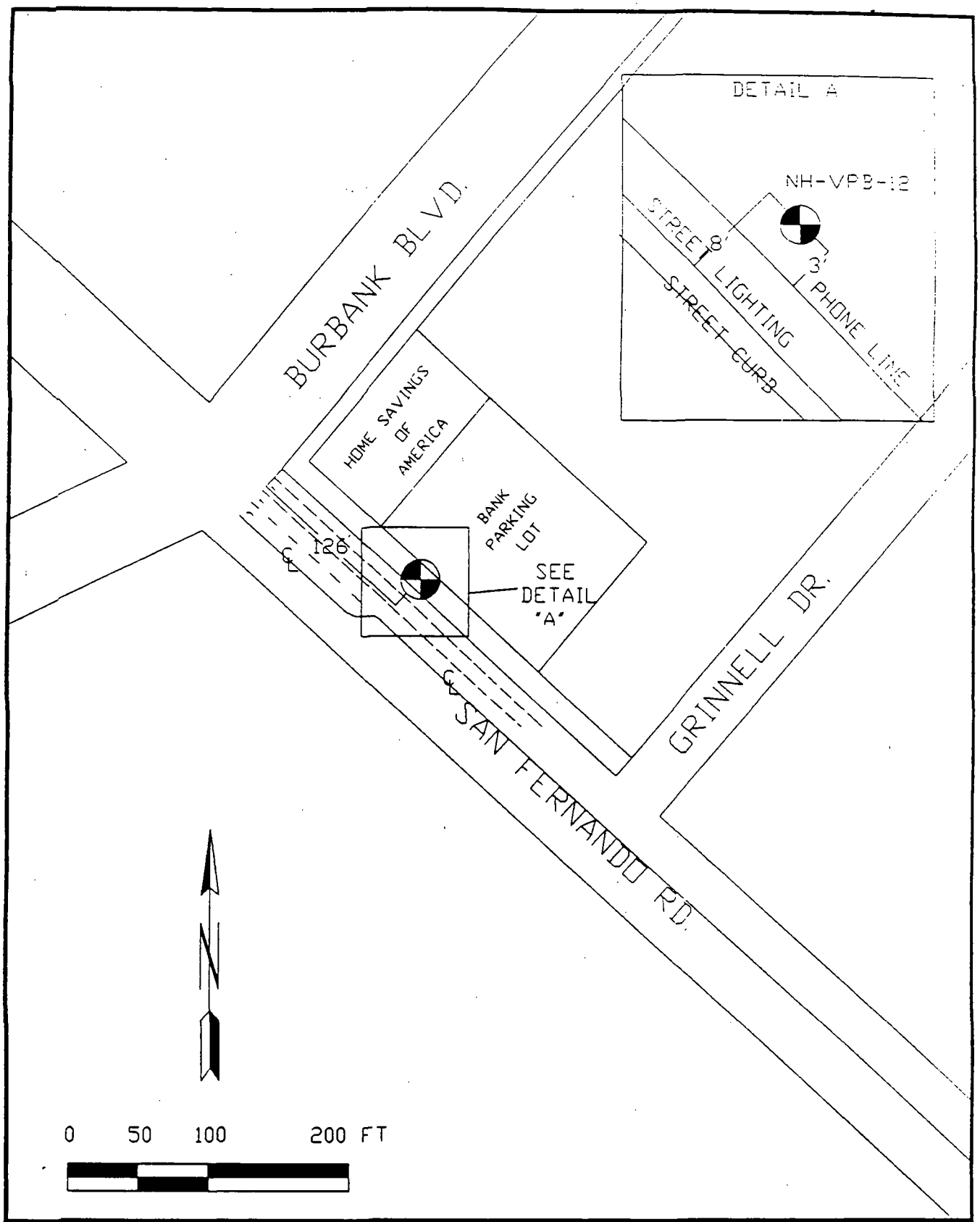
- VEHICULAR INGRES/EGRESS WILL BE MAINTAINED DURING ENTIRE DRILLING OPERATION.
- A STARTER HOLE WILL BE HAND DUG A FEW FEET BELOW GRADE TO ASSURE NO DISRUPTION OF SEWER CONNECTION.

REV. 7/24/89

L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD

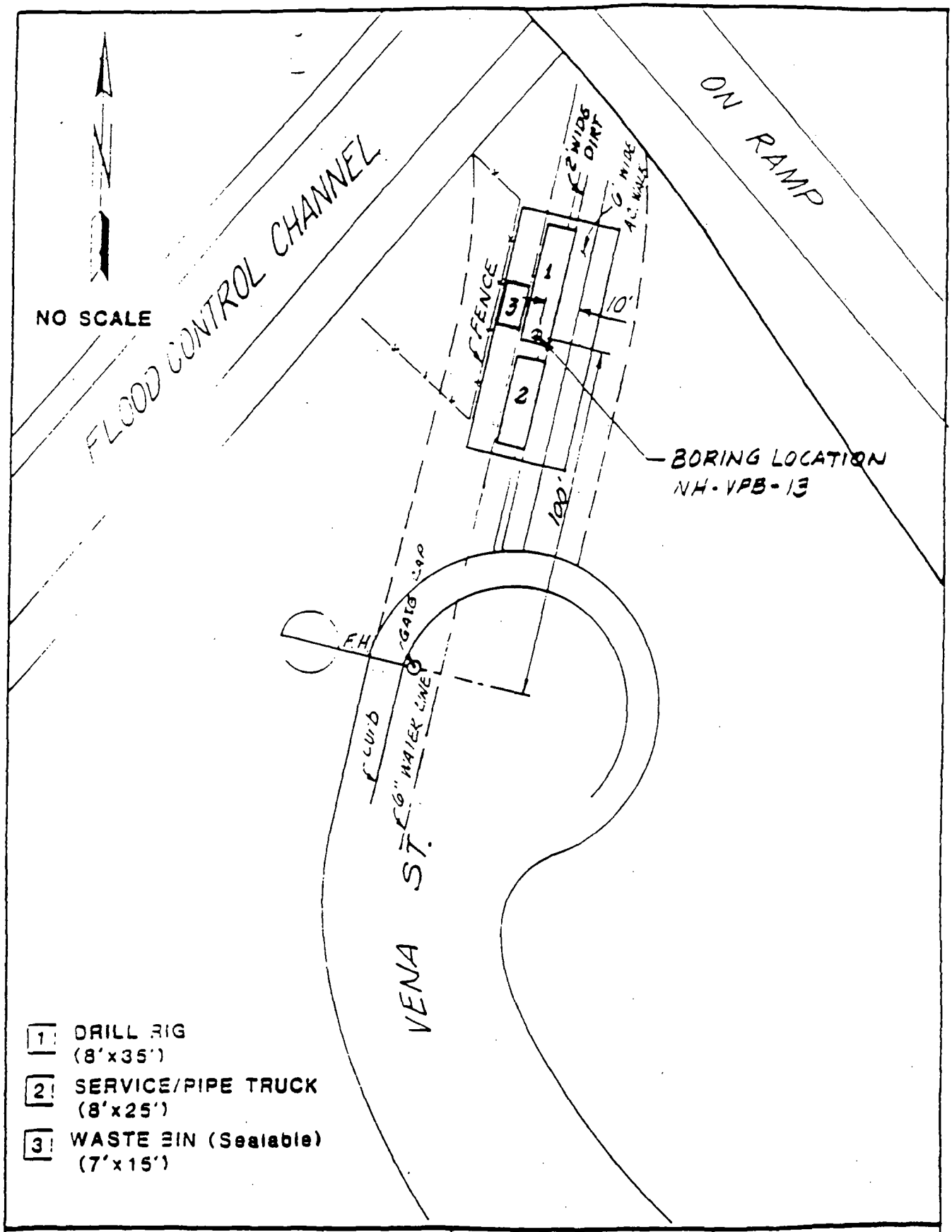
VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-11

387.NH0017



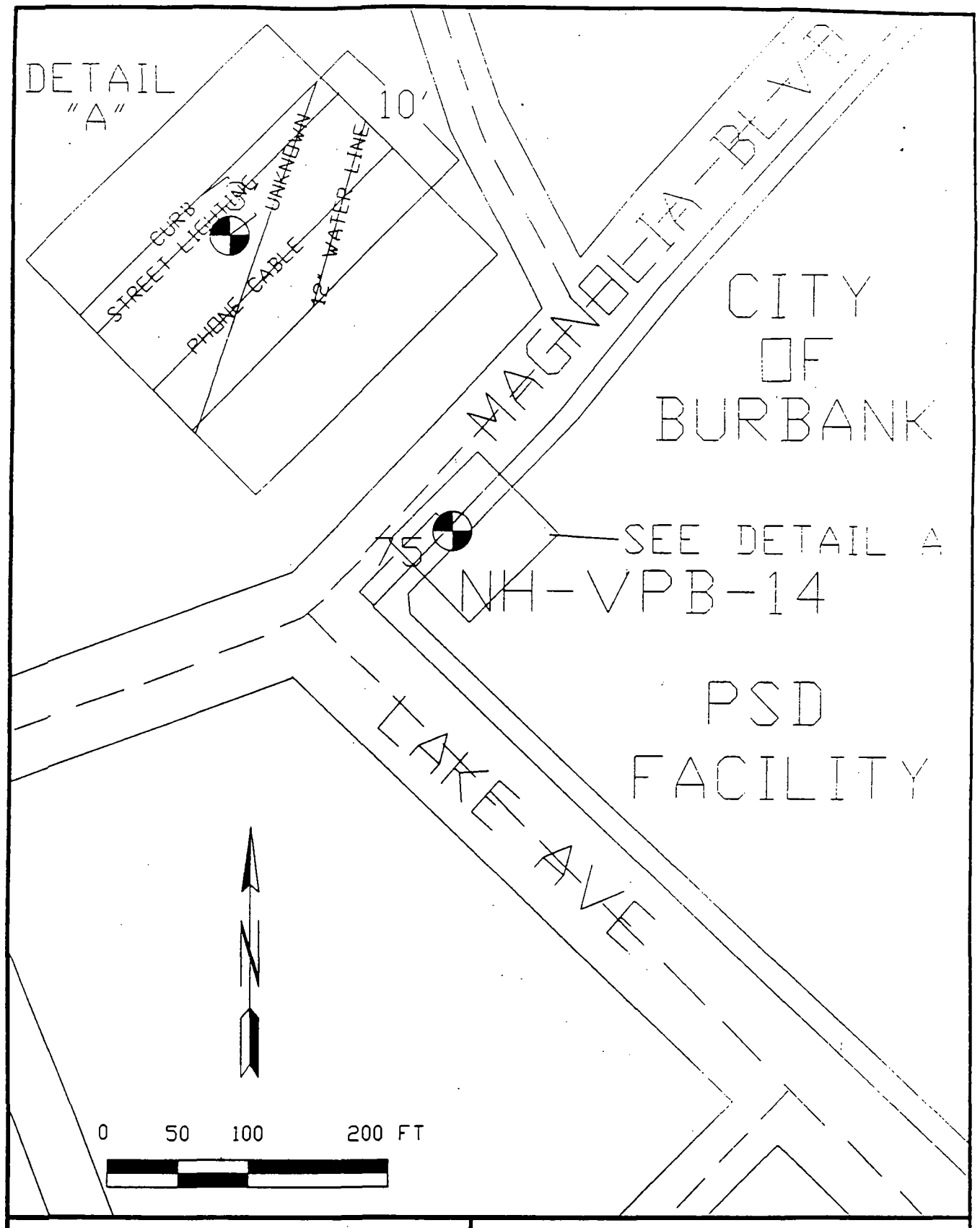
L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-12



[illegible] SAN FERNANDO VALLEY, CA. DEMETAL BORINGS WELL SITE	VERTICAL PROFILE BORINGS PROPOSED LOCATION OF BORING NH-VPB-13

887.NH0019



L.A.D.W.P.
SAN FERNANDO VALLEY R.I.
NORTH HOLLYWOOD NPL SITE

VERTICAL PROFILE BORINGS
PROPOSED LOCATION OF BORING
NH-VPB-14

Appendix C
DESCRIPTION OF SAS ANALYTICAL PROCEDURES

Analysis of Carbonate, Bicarbonate and Total Alkalinity in Water by Standard Method 403:

Analytes: Carbonate, bicarbonate and total alkalinity

Sample Matrices: Low concentration water samples (specify whether surface water, groundwater, drinking water, waste or leachate).

Analytical Procedure and Detection Limits: Follow "Standard Methods for the Examination of Water and Wastewater", 16th Ed., Method 403, Procedures 4c and 4d. Contract required detection limit (CRDL) is 2.0 mg/L of $CaCO_3$ or lower for low level samples and 20 mg/L of $CaCO_3$ for high level samples.

1. Samples are to be kept at 4°C until analysis and validation of results are completed.
2. Samples will be unfiltered. Report the carbonate, bicarbonate and total alkalinity results for each sample.
3. Do not use titrant volumes greater than 50 mL. Dilute and re-analyze any sample aliquots requiring more than 50 mL titrant.

Contract Holding Times: Contract required analysis holding time is 12 days from the date of sample receipt by the laboratory.

Calibration Procedure and Criteria: Not applicable

Internal Quality Control Checks, Control Limits and Corrective Action:

1. Standardize the pH meter and the titrant each day. Standardize the pH meter using at least 2 buffers which bracket the end points. Use Na_2CO_3 to standardize titrant, according to Section 3 of Method 403.
2. Analyze 1 set of EPA QC Mineral Reference Samples (at 2 concentration levels) at a frequency of one per sample delivery group. Recoveries of 90-110% are required.
3. Analyze laboratory blanks at a frequency of one per group of 20 or fewer samples. Laboratory blanks must contain less than 2.0 mg/L of $CaCO_3$ for low level analyses and less than 10 mg/L of $CaCO_3$ for high level analyses.
4. Analyze laboratory duplicates at a frequency of one per group of 20 or fewer samples. Difference in duplicate sample results must be less than 10% for concentrations exceeding 20 mg/L and less than 2.0 mg/L for concentrations below 20 mg/L.
5. If above control limits are exceeded, take appropriate actions to correct the problems and re-analyze the affected samples.

Carbonate, Bicarbonate and Total Alkalinity in Water by Method 403 (Continued):

Data Calculations and Reporting Units: Calculate and report the carbonate, bicarbonate and total alkalinity results according to Section 5 of Method 403. Sample results are to be reported in the concentration unit of milligram per liter (mg/L) of $CaCO_3$. All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

Documentation and Deliverables: Identify the QC reference sample lot numbers used and the corresponding true values with 95% confidence intervals. Report all bench records tabulating pH meter calibration, titrant standardization, laboratory control samples, titration and indicator blanks, sample volumes and titrant volumes, matrix spikes, laboratory duplicates, etc. Indicate date and time of analysis. Provide all raw data, including copies of instrument read-outs and worksheets used to calculate results. Raw data are to be organized systematically and each page is to be numbered.

Analysis of Inorganic Anions in Water by Ion Chromatography-EPA Method 300.0:

Analytes: Chloride, fluoride, nitrate-N, nitrite-N, ortho-phosphate-P and sulfate

Sample Matrices: Low concentration water samples (specify whether surface water, groundwater, drinking water, waste or leachate).

Analytical Procedure and Detection Limits: Follow the EPA Method 300.0. Contract required detection limits (CRDL) are 0.10 mg/L for fluoride, nitrate-N and nitrite-N, and 1.0 mg/L or lower for chloride, o-phosphate-P and sulfate.

1. Samples are to be kept at 4°C until analysis and validation of results are completed.
2. Confirmatory techniques such as sample dilution and spiking must be performed when the identification of a peak in the chromatogram is questionable and for the confirmation of all positive results reported. Spike the sample with an appropriate amount of the relevant standard and re-analyze.
3. A laboratory blank is to be analyzed after the analysis of an unusually concentrated sample, to check for contamination by carry-over.

Contract Holding Times: Contract required analysis holding times are 24 hours for nitrate-N, nitrite-N and o-phosphate-P, and 25 days for chloride, fluoride and sulfate, from the date of sample receipt by the laboratory.

Calibration Procedure and Criteria: Calibrate according to Section 9 of EPA Method 300.0, with the following specifications:

1. The working standards are to be prepared daily from the stock solutions. Stock standards are to be stored at 4°C and replaced after one month.
2. Use at least five calibration standards (not including zero standard) to obtain a standard calibration curve. Calculate and report the retention time (RT) window, response factor (RF) and percent relative standard deviation (%RSD) for each analyte.
3. Calibration verification standards at the mid-point concentration are to be analyzed at the beginning of each working day, whenever the anion eluent is changed, and after every 20 or fewer samples. Percent differences (%D) in RF of less than ±10% are required. For %D of greater than ±10%, recalibrate as described in Section 9.4 of EPA Method 300.0.

Internal Quality Control Checks, Control Limits and Corrective Action:

1. Analyze laboratory control samples (LCS) at a frequency of one per sample delivery group. Recoveries of 85-115% are required.

Inorganic Anions in Water by Method 300.0 (Continued):

2. Analyze laboratory blanks at a frequency of one per group of 20 or fewer samples and after analysis of unusually concentrated samples. Laboratory blanks must not contain any anions at concentrations above the CRDL.
3. Samples containing anions at concentrations above the calibration range are to be diluted and re-analyzed. Report the results and documentation for both analyses.
4. Analyze matrix spikes at a frequency of one per group of 20 or fewer samples. Matrix spike concentrations are to be greater than 30% of the sample concentrations, but spiked samples must not exceed the working range of the standard curve. Recoveries of 85-115% are required.
5. Analyze laboratory duplicates at a frequency of one per group of 20 or fewer samples. The relative percent difference (RPD) of duplicate sample results must be less than 10%.
6. If above control limits are exceeded, take appropriate actions to correct the problems and re-analyze the affected samples.

Data Calculations and Reporting Units: Calculate the sample results according to Section 12 of EPA Method 300.0. Sample results are to be reported in the concentration unit of milligram per liter (mg/L). All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

Documentation and Deliverables: Identify the laboratory control sample as to source, reference sample lot number and the corresponding true value with 95% confidence interval. Report all bench records tabulating calibration standards (RT window, RF, %RSD and %D), laboratory control samples, laboratory blanks, samples, matrix spikes, laboratory duplicates, etc. Indicate date and time of analysis. Provide all raw data, including copies of instrument read-outs and worksheets used to calculate results. Raw data are to be organized systematically and each page is to be numbered.

Analysis of Inorganic Anions in Water by Ion Chromatography-EPA Method 300.0:

Analytes: Chloride, fluoride, total nitrate/nitrite-N, ortho-phosphate-P and sulfate

Sample Matrices: Low concentration water samples (specify whether surface water, groundwater, drinking water, waste or leachate).

Analytical Procedure and Detection Limits: Follow the EPA Method 300.0. Contract required detection limits (CRDL) are 0.10 mg/L for fluoride and total nitrate/nitrite-N, and 1.0 mg/L or lower for chloride, o-phosphate-P and sulfate.

1. Samples are to be kept at 4°C until analysis and validation of results are completed.
2. Confirmatory techniques such as sample dilution and spiking must be performed when the identification of a peak in the chromatogram is questionable and for the confirmation of all positive results reported. Spike the sample with an appropriate amount of the relevant standard and re-analyze.
3. A laboratory blank is to be analyzed after the analysis of an unusually concentrated sample, to check for contamination by carry-over.

Contract Holding Times: Contract required analysis holding times are 5 days for total nitrate/nitrite-N and o-phosphate-P, and 25 days for chloride, fluoride and sulfate, from the date of sample receipt by the laboratory.

Calibration Procedure and Criteria: Calibrate according to Section 9 of EPA Method 300.0, with the following specifications:

1. The working standards are to be prepared daily from the stock solutions. Stock standards are to be stored at 4°C and replaced after one month.
2. Use at least five calibration standards (not including zero standard) to obtain a standard calibration curve. Calculate and report the retention time (RT) window, response factor (RF) and percent relative standard deviation (%RSD) for each analyte.
3. Calibration verification standards at the mid-point concentration are to be analyzed at the beginning of each working day, whenever the anion eluent is changed, and after every 20 or fewer samples. Percent differences (%D) in RF of less than ±10% are required. For %D of greater than ±10%, recalibrate as described in Section 9.4 of EPA Method 300.0.

Internal Quality Control Checks, Control Limits and Corrective Action:

1. Analyze laboratory control samples (LCS) at a frequency of one per sample delivery group. Recoveries of 85-115% are required.

Inorganic Anions in Water by Method 300.0 (Continued):

2. Analyze laboratory blanks at a frequency of one per group of 20 or fewer samples and after analysis of unusually concentrated samples. Laboratory blanks must not contain any anions at concentrations above the CRDL.
3. Samples containing anions at concentrations above the calibration range are to be diluted and re-analyzed. Report the results and documentation for both analyses.
4. Analyze matrix spikes at a frequency of one per group of 20 or fewer samples. Matrix spike concentrations are to be greater than 30% of the sample concentrations, but spiked samples must not exceed the working range of the standard curve. Recoveries of 85-115% are required.
5. Analyze laboratory duplicates at a frequency of one per group of 20 or fewer samples. The relative percent difference (RPD) of duplicate sample results must be less than 10%.
6. If above control limits are exceeded, take appropriate actions to correct the problems and re-analyze the affected samples.

Data Calculations and Reporting Units: Calculate the sample results according to Section 12 of EPA Method 300.0. Sample results are to be reported in the concentration unit of milligram per liter (mg/L). All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

Documentation and Deliverables: Identify the laboratory control sample as to source, reference sample lot number and the corresponding true value with 95% confidence interval. Report all bench records tabulating calibration standards (RT window, RF, %RSD and %D), laboratory control samples, laboratory blanks, samples, matrix spikes, laboratory duplicates, etc. Indicate date and time of analysis. Provide all raw data, including copies of instrument read-outs and worksheets used to calculate results. Raw data are to be organized systematically and each page is to be numbered.

Analysis of Nitrate and Nitrite in Water by EPA Method 353.2 or Method 353.3

Analytes: Nitrate and nitrite

Sample Matrices: Low concentration water samples (specify whether surface water, groundwater, drinking water, waste or leachate).

Analytical Procedure and Detection Limits: Follow the EPA Method 353.2 (colorimetric, automated, cadium reduction) or Method 353.3 (colorimetric, manual, cadmium reduction). Contract required detection limit (CRDL) is 0.10 mg/L as nitrogen (N) or lower.

1. Samples are to be kept at 4°C until analysis and validation of results are completed.
2. Prior to analysis, samples are to be neutralized to pH 5-9. Samples will be unfiltered.
3. Samples may be diluted up to ten-fold prior to analysis providing that the final analytical working range does not exceed 0.1 to 10.0 mg/L N.

Contract Holding Times: Contract required analysis holding time is 25 days from the date of sample receipt by the laboratory.

Calibration Procedure and Criteria:

1. Use at least five calibration standards (not including a zero standard) to obtain a standard calibration curve. The analytical working range must not exceed 0.1 to 10.0 mg/L N.
2. Calibration verification standards at the mid-point concentration are to be analyzed at a frequency of one per group of 10 or fewer samples and at the end of the analysis of a sample delivery group. Recoveries of 90-110% are required.
3. If more than one reduction column is used, separate calibrations, laboratory blanks and QC analyses are required for each reduction column. The column used must be identified for each analytical results.

Internal Quality Control Checks, Control Limits and Corrective Action:

1. Analyze one set of EPA Nutrient QC Reference Samples (Concentrations 1 and 2) or EPA F/NO_3 QC Samples (WS series, Concentrations 1 and 2) at a frequency of one per sample delivery group. Recoveries of 85-115% are required.
2. Analyze laboratory blanks at a frequency of one per group of 20 or fewer samples. Laboratory blanks are prepared by adding 1.0mL of H_2SO_4 to one liter of reagent water; neutralize prior to analysis. Laboratory blanks must contain less than 0.10 mg/L of nitrogen.
3. Samples containing nitrate/nitrite at concentrations above the calibration range are to be diluted and re-analyzed. Report the results and documentation for both analyses.

Nitrate and Nitrite in Water by Method 353.2 or 353.3 (Continued):

4. Analyze matrix spikes at a frequency of one per group of 20 or fewer samples. Matrix spike concentrations are to be greater than 30% of the sample concentrations, but spiked samples must not exceed working range of the standard curve. Recoveries of 85-115% are required.
5. Analyze laboratory duplicates at a frequency of one per group of 20 or fewer samples. Difference in duplicate sample results must be less than 10% for concentrations exceeding 1.0 mg/L and less than 0.1 mg/L for concentrations below 1.0 mg/L.
6. If above control limits are exceeded, take appropriate actions to correct the problems and re-analyze the affected samples.

Data Calculations and Reporting Units: Calculate the sample results according to Section 8 of EPA Method 353.2 or Method 353.3. Sample results are to be reported to the nearest 0.1 mg/L for concentrations less than 1.0 mg/L N and to 2 significant figures for concentrations exceeding 1.0 mg/L N. All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

Documentation and Deliverables: The test procedure used must be clearly identified. Identify the QC reference sample lot numbers used and the corresponding true values with 95% confidence intervals. Report all bench records tabulating calibration standards, laboratory control samples, laboratory blanks, samples, matrix spikes, laboratory duplicates, etc. Indicate date and time of analysis. All sample treatment to remove interferences are to be documented. Provide all raw data, including copies of absorbances or concentration read-outs and worksheets used to calculate results. Raw data are to be organized systematically and each page is to be numbered.

Analysis of Total Dissolved Solids (TDS) in Water by EPA Method 160.1:

Analytes: Total dissolved solids (TDS, 180°C)

Sample Matrices: Low concentration water samples (specify whether surface water, groundwater, drinking water, waste, or leachate).

Analytical Procedure and Detection Limits: Follow the EPA Method 160.1 (residue, filterable; gravimetric, dried at 180°C). Contract required detection limit (CRDL) is 20 mg/L of dissolved solids or lower.

1. Samples are to be kept at 4°C until analysis and validation of results are completed.
2. If the pH value is less than 4.0, raise the pH of the aliquot (using NaOH titrant) to between pH 4 and 8. Subtract the weight of sodium added from the weight of residue.
3. Residue will be weighed to constant weight pursuant to Section 7.6 of EPA Method 160.1. Constant weight is defined as a) less than 0.5 mg or less than 4% weight loss from the previous weight, whichever is smaller, or b) dried overnight (12 hours drying time) with a single weight used for calculations.

Contract Holding Times: Contract required analysis holding time is 5 days from the date of sample receipt by the laboratory.

Calibration Procedure and Criteria: Not applicable.

Internal Quality Control Checks, Control Limits and Corrective Action:

1. Analyze 1 set of EPA QC Mineral Reference Samples (at 2 concentration levels) at a frequency of one per sample delivery group. Recoveries of 85-115% are required.
2. Analyze laboratory blanks (100 mL of filtered reagent water) at a frequency of one per group of 20 or fewer samples. Laboratory blanks must contain less than 20 mg/L of TDS.
3. Use standard aliquots of 100 mL. If residue in sample is greater than 200 mg, repeat the analysis using a smaller sample aliquot.
4. Analyze sample duplicates at a frequency of one per group of 20 or fewer samples. Difference in duplicate sample results must be less than 10% for concentrations exceeding 200 mg/L and less than 2.0 mg/L for concentrations below 200 mg/L.
5. If above control limits are exceeded, take appropriate actions to correct the problems and re-analyze the affected samples.

Total Dissolved Solids (TDS) in Water by Method 160.1 (Continued):

Data Calculations and Reporting Units: Calculate the sample results according to Section 8 of EPA Method 160.1. Sample results are to be reported in the concentration unit of milligram per liter (mg/L) of dissolved solids. All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

Documentation and Deliverables: Identify the QC reference sample lot numbers used and the corresponding true values with 95% confidence intervals. Report all bench records of tare weights, final weights, additional weights to determine constant weights and volume filtered for laboratory blanks, reference samples, samples, sample duplicates, etc. Indicate date and time of the determination of tare weights, sample filtration and determination of residue weights and constant residue weights. Provide all raw data, including copies of worksheets used to calculate results. Raw data are to be organized systematically and each page is to be numbered.

Analysis of RAS & SAS TCL Volatiles in Water, 25 mL Purge:

Analytes: Routine Analytical Services (RAS) target compound list (TCL) volatiles.

Sample Matrices: Low concentration water samples.

Analytical Procedure and Quantitation Limits: Follow the RAS Statement of Work (SOW) for volatiles analysis. Samples are to be analyzed using a 25 mL purge volume, so that the quantitation limits will be decreased by a factor of 5. Contract required quantitation limits (CRQL) are 1.0 ug/L for compounds with RAS CRQL of 5 ug/L and 2.0 ug/L for compounds with RAS CRQL of 10 ug/L. RAS CRQL of 10 ug/L are acceptable for acetone, 2-butanone, 4-methyl-2-pentanone and 2-hexanone.

1. Capillary columns may be used for this analysis, as long as the laboratory uses the instrument parameters in EPA Method 524.2 as guidelines, uses the internal standards and surrogates specified in the RAS SOW and demonstrates that the analysis meets all the performance and QA/QC criteria contained in the RAS SOW and in this contract.
2. For foamy samples, fritless sparge tubes are recommended to reduce foaming of the samples. Dilution of the foamy samples is to be avoided.

Contract Holding Times: Contract required analysis holding time is 10 days from the date of sample receipt by the laboratory.

Calibration Procedure and Criteria:

1. Follow the calibration procedure specified in the RAS SOW. The 5 mL standards are to be diluted to 25 mL before purging.
2. QA/QC criteria in the current RAS SOW must be met, except that the response factor criteria for bromoform and 1,1,2,2-tetrachloroethane are not required.

Internal Quality Control Checks, Control Limits and Corrective Action:

1. Follow the QC requirements specified in the RAS SOW.

Data Calculations and Reporting Units: Follow the calculations specified in the RAS SOW. The sample results are to be reported in the concentration unit of microgram per litre (ug/L). All records of analysis and calculations must be legible and sufficient to recalculate all sample concentrations and QC results. Include an example of the calculations in the data package.

Documentation and Deliverables: Follow the documentation and deliverables requirements specified in the RAS SOW.

Analysis of Radon by EPA 600/2-87/082 Appendix B

Analyte. Radon

Sample Matrices. Low concentration groundwater samples.

Analytical Procedure and Detection Limits. Follow the liquid scintillation method described in Appendix B attached. Detection limits are affected by matrix interferences and counting times. A target detection limit of 100 pCi/L is desirable at a count rate not to exceed 1,000 minutes.

Contract Holding Time. Two days following sample collection, 24 hrs after receipt at laboratory

Calibration Procedure and Criteria

1. Use traceable NBS radium 226 standard solutions for all Radon 222 analysis.
2. Calibrate the instrument according to the manufacturer's specifications, daily.
3. Calibrate for Radon 222 analysis according to Appendix B, daily.

Internal Quality Control Checks, Control Limits, and Corrective Action

1. The calibration and counting efficiency must be verified before use by analyzing a QC check sample of a traceable NBS radium 226 standard at a mid-level concentration. This QC check sample must also be run every 20 samples in the analytical batch and after the last sample. The recovery must be 80 to 120 percent of the true value. The laboratory may alternatively establish statistical control limits at 99 percent confidence (average ±3 standard deviations) using a minimum of 20 points. These limits must be updated at least annually.

2. Analyze a blank at a frequency of one per analytical batch or one per 20 samples of the same matrix, whichever is more frequent. The blank concentration must be less than the detection limit.

3. Analyze a duplicate and a spike at a frequency of one per analytical batch or one per 20 samples of the same matrix, whichever is more frequent. The laboratory must establish appropriate control limits for spike recovery at 99 percent confidence (average ±3 standard deviations) using a minimum of 20 points. These limits must be updated at least annually. The difference between duplicate results must not exceed 25 percent of their average.

4. If the above control limits are exceed, appropriate corrective action must be taken, and the affected samples must be reanalyzed.

Data Calculations and Reporting Units. Report results in pCi/L.

Documentation and Deliverables

1. Provide all sample and blank results.

2. Provide tabular summaries of QC check sample, spike, and duplicate results, showing reference numbers and control limits used.

3. Provide raw data of standard concentrations, counts per minute and counting times, sample volumes and dilutions. All raw data must be identified with sample numbers and dates and times of sample collection, dates and times of starting analysis, ingrowth in days, and all radiological calculations.

4. The data package must be systematically organized, with each page sequentially numbered.

Other Requirements

Laboratory will provide the appropriate number of liquid scintillation vials (as described on page 25, Note 1 of the attached Appendix B) filled with 10 ml of liquid scintillation mix.

APPENDIX B

ANALYTICAL TEST PROCEDURE "THE DETERMINATION OF RADON IN DRINKING WATER"

(EPA EASTERN ENVIRONMENTAL
RESEARCH FACILITY, MONTGOMERY, ALABAMA)

THE DETERMINATION OF RADON IN DRINKING WATER

There are several published methods for the determination of radon (Rn-222). Those include de-emanation into a scintillation flask or Lucas Cell, gamma spectrometry, high volume extraction followed by liquid scintillation counting, and direct low-volume liquid scintillation counting.

Of the aforementioned methods, the last one is probably the most rapid and simplest while other methods may exhibit higher sensitivity. Good precision and accuracy have been shown for samples having radon concentrations of several hundred pCi/L or greater using direct, low-volume liquid scintillation counting. It is especially suited for large numbers of samples over a short period of time. For reasons previously stated, direct low volume scintillation counting is the recommended procedure for determining radon in drinking water, since high sensitivity (e.g., 1 pCi/L or less) is not necessary.

Principle

Samples are collected using the sampling procedure described in EPA/EERF-MANUAL-78-1. Samples are counted by liquid scintillation counting and radon concentration is computed from total count rate due to alpha and beta decay.

Special Apparatus

1. Sampling kit which includes a sampling funnel and tube with standard faucet fitting, two 12 mL disposable syringes with 20 gauge 1-1/2 inch hypodermic needles, and glass scintillation vials with 10 mL of liquid scintillation mix. See Note 1.
2. Optional mailing tubes.
3. Liquid scintillation counter, ambient temperature, with automatic sample changer.

Reagents

1. Mineral oil based liquid scintillation mix PSS-007H or equivalent, if mailing via regular mail. Otherwise, a toluene based liquid scintillation mix is acceptable. See Note 2.
2. Distilled water.
3. A traceable National Bureau of Standards (NBS) radium-226 standard solution.

Procedure

1. Attach the sampling funnel and tube to a faucet with the standard faucet fitting.
2. Slowly turn on the water and allow a steady stream to flow out of the funnel for approximately 2 minutes. This purges the tube and assures a fresh sample.
3. Reduce the flow of water and invert the funnel. The flow should be adjusted to a level that does not cause turbulence in the pool of water contained in the funnel. Allow excess water to spill over one edge of the funnel.
4. Examine the hose connection and tubing for air bubbles or pockets. If these are visible, raise or lower the funnel until they are removed.
5. Place the tip of the hypodermic needle approximately 3 cm under the surface of the water in the funnel and withdraw a few mL of water and eject this water. Using this procedure, rinse the syringe and hypodermic needle two or three more times.
6. Again, place the tip of the needle approximately 3 cm below the surface of the water and withdraw approximately 12 mL.

   NOTE: The water should be pulled into the syringe slowly to avoid extreme turbulence and collection of air bubbles. If large air bubbles are noticed in the syringe, the sample should be ejected and redrawn.

7. Invert the syringe and slowly eject any small air bubbles and extra water. Retain precisely 10 mL of water in the syringe.
8. Remove the cap from a vial and carefully place the tip of the needle into the bottom of the liquid scintillation solution. Slowly eject the water from the syringe into the vial.

   NOTE: The water is injected under the liquid scintillation solution to prevent loss of radon from the sample. If the water is forced out of the syringe with much pressure, it will cause turbulence in the solution and could result in loss of radon.

9. Carefully withdraw the hypodermic needle from the vial and replace the cap. The cap should be tightly secured to prevent leakage.
10. Repeat the previous steps to obtain two separate samples from each source. This completes the sample collection.

11. If the vials are to be mailed, the two samples from each source should be individually wrapped with packing material such as newspaper or paper toweling, placed in the mailing tube, and mailed as soon as possible. Due to the short half-life of radon (3.82 days), the quick return of the samples for analysis is of primary importance.

Counting Procedure

1. Scintillation vials are cleaned with alcohol and shaken while allowing 3 hours before counting.
2. A background sample, consisting of 10 mL of distilled water and 10 mL of scintillation solution, and a standard radium-226 solution sample are counted for 50 minutes at the beginning of counting and after every 10 drinking water samples. Drinking water samples are also counted for 50 minutes.
3. An optional second counting of samples is desirable.

Preparation of Standard

1. Add a known quantity of traceable NBS radium-226 standard solution to a known volume of distilled water.
2. Combine a 10 mL aliquot of the radium-226 standard solution with 10 mL of scintillation mix in a 20 mL glass scintillation vial.
3. Allow approximately 21 days for buildup of radon (i.e., secular equilibrium with radium-226).
4. Shake vial to transfer nearly all the radon to the scintillation mix phase (radon is highly soluble in the scintillation mix). The radium-226 remains in the aqueous phase and, therefore, does not contribute significantly to the count rate.
5. Allow the buildup of the radon short-lived progeny by waiting 3 hours before counting.
6. Count the standard and background samples for 50 minutes or longer.
7. Subtract the background counts per minute (cpm) from the gross cpm for the standard and divide by the known radon activity (i.e., radon activity equals radium-226 activity at secular equilibrium) to obtain the cpm/pCi conversion factor.

Calculations

Calculate the picocuries per liter of radon in the sample by using the following equation:

$$A = \frac{(C_S - C_B)\ (1000\ mL)}{(CF)\ (D)\ (10\ mL)\ (1\ liter)}$$

where: A = picocuries of radon per liter of, sample
C_S = sample cpm
C_B = background cpm
CF = cpm/pCi conversion factor
D = Decay correction.

Decay Correction:

$$\text{Decay correction (D)} = e^{-\frac{0.693(T)}{t_{1/2}}}$$

T = Time in days from collection time to midpoint of counting time.

$t_{1/2}$ = Radiological half-life of radon, 3.82 days.

Notes

1. Liquid scintillation vials are standard 20 mL capacity. White caps having polyethylene inner seals are used.
2. PSS-007H is available from Pilot Chemicals Division, New England Nuclear, Watertown, MA 02172. Do not use a scintillation mix containing emulsifier.

References

1. Homma, Y. and Murakami, Y., 1977, J. Radioanalyt. Chem. 36, 177.
2. Horton, T. R., 1983, "Methods and Results of EPA's Study of Radon in Drinking Water," EPA 520/5-83-027.
3. Lucas, H. F., 1957, "Improved Low-Level Alpha-Scintillation Counter for Radon," Rev. Sci. Inst. 28, 680.
4. Lucas, H. F., 1964, "A Fast and Accurate Survey Technique for Both Radon-222 and Radium-226," in The Natural Radiation Environment, U. of Chicago Press, 315.
5. Noguchi, M., 1964, Radioisotopes 13, 362 (in Japanese).
6. Prichard, H. M. and Gesell, T. F., 1977, "Rapid Measurements of Rn-222 Concentrations in Water with a Commercial Liquid Scintillation Counter," Health Phys. 33, 577.
7. U.S. Environmental Protection Agency, 1978, "Radon in Water Sampling Program," EPA/EERF-MANUAL-78-1.

Analysis of Gross Alpha/Beta Radioactivity by EPA 900.0

Analyte. Gross Alpha/Beta Radioactivity

Sample Matrices. Low concentration groundwater samples.

Analytical Procedure and Detection Limits. Follow procedure for EPA Metho 900.0, attached. Detection limits are dependent on sample size, counting system characteristics, matrix interferences, and routing times. The National Primary Interim Drinking Water Regulations (NPIDWR) require a gross beta detection limit of 4 pCi/L, and alpha detection limit of 1 pCi/L for compliance with Part 141.15(a) and a gross alpha detection limit of 3 pCi/L for compliance with Part 141.15(b).

Calibration Procedure and Criteria

1. Use traceable NBS American-241 standard solutions for all gross alpha calibrations.

2. Use strontium-90, equilibrium with ytttrium-90 for gross beta calibrations.

3. Calibrate all counting instruments according to manufacturer's specifications, daily.

4. For each counting instrument separate alpha and beta self-absorption graphs must be prepared.

Internal Quality Control Checks, Control Limits, and Corrective Action

1. The calibration and counting efficiency must be verified before use by analyzing a check samples of americium-241 for alpha and strontium-90 for beta at mid-level concentrations. These QC check samples must also be run every 20 samples in the analytical batch and after the last sample. The recoveries must be 80 to 120 percent of the true value. The laboratory may alternatively establish statistical control limits at 99 percent confidence (average ± 3 standard deviations) using a minimum of 20 points for each alpha and beta measurements. These limits must be updated at least annually.

2. Analyze a blank at a frequency of one per analytical batch or one per 20 samples of the same matrix, whichever is more frequent. The blank concentrations of alpha and beta must be less than the detection limit.

3. Analyze a duplicate and a spike at a frequency of one per analytical batch or one per 20 samples of the same matrix, whichever is more frequent. The laboratory must establish appropriate control limits for spike recovery at 99 percent confidence (average ± 3 standard deviations) using a minimum of 20 points. These limits must be updated at least annually. The difference between duplicate results must not exceed 25 percent of their average.

4. If the above control limits are exceed, appropriate corrective action must be taken, and the affected samples must be reanalyzed.

Date Calculations and Reporting Units. Report results in pCi/L.

Documentation and Deliverables

1. Provide all sample and blank results.

2. Provide tabular summaries of QC check sample, spike, and duplicate results, showing reference numbers and control limits used.

3. Provide raw data of standard concentrations, counts per minute and counting times, sample volumes and dilutions. All raw data must be identified with sample numbers and dates and times of sample collection, dates and times of starting analysis, ingrowth in days, and all radiological calculations.

4. The data package must be systematically organized, with each page sequentially numbered.

Appendix D
CLP PAPERWORK INSTRUCTIONS

U.S. EPA Region 9
CLP PAPERWORK INSTRUCTIONS

Paperwork is provided to the sampler by the Region 9 RSCC one week before sampling begins. The samplers must contact the RSCC to obtain paperwork.

ORGANIC AND INORGANIC TRAFFIC REPORTS

Use these forms when shipping RAS or RAS plus SAS samples. Complete one form per laboratory, per shipment. It is not necessary to include a Traffic Report in each cooler.

Top Right - A Case Number is assigned to the sampling project when a SMO coordinator initiates the lab selection process. The Region 9 RSCC will notify the sampler of the case number by phone. This same case number should also appear on the corresponding Chain-of-Custody Record. If the lab will be conducting Special Analytical Service (SAS or RAS+SAS), the SAS number must also be recorded on the form.

Box 1 - Circle the appropriate Superfund code. If sampling is non-superfund enter the program name, e.g., RCRA.

PA	-	Preliminary Assessment
SI	-	Site Investigation
ESI	-	Expanded Site Investigation
RIFS	-	Remedial Investigation Feasibility Study
RD	-	Remedial Design
RA	-	Remedial Action
ER	-	Emergency Response (Removal)
NPLD	-	National Priorities List Delete
O&M	-	Operations and Maintenance

Enter the site name, the city, state, and Superfund site spill ID code (provided by the region) in the designated spaces. This information does not go through to the Lab's copy.

Box 2 - Enter Region No. 9, your sampling company and your name.

Box 3 - Enter the name, address and contact person of the CLP lab contracted to do the analyses. This information is supplied to the sampler by the RSCC after the lab contract has been awarded.

Box 4 - Enter the beginning and ending sampling dates.

Box 5 - Enter the date shipped, the carrier code (e.g., F = Federal Express) and the airbill number.

COLUMNS

Left edge column - Carefully transcribe the CLP Sample Number from the printed sample labels provided. A stack of labels will be provided to the samplers by the RSCC.

Col. A - Enter the appropriate sample description code from Box 6. Note: Item #6 "Oil" and Item #7 "Waste" are for RAS plus SAS projects only.

Col. B - Organic - If sample is estimated to be low or medium concentration, enter "L". If sample is high concentration (comprised of more that 15% of a compound), it must be sent to a SAS lab. Notify the Region 9 RSCC if you need a SAS lab for high concentration samples.

Inorganic - Enter the estimated concentration. Low level is less than 10ppm of a for a single compound; medium level is between 10ppm and 15 percent; and high level is above 15 percent.

REMINDER: Ship medium and high concentration organic and inorganic samples in metal cans.

Col. C - Check the appropriate RAS analytical fractions requested for each sample.

Col. D - Special Handling Instructions include information about potential contaminants and SAS requirements. When shipping RAS plus SAS samples, coding the SAS parameters will save space (e.g. A = sulfate, B = low detection limits). Also, designate the Lab QC Sample by writing "Lab QC" in this column.

Col. E - Enter the station location number corresponding to the CLP sample number.

Bottom of Page - In space available list any preservatives used (e.g., VOAs preserved with 2 drops 1:1 HCl).

Back Page - Instruction summarizing CLP sample volumes, packaging and reporting requirements are printed on the back of the Traffic Reports..

SAS PACKING LIST

If samples are shipping samples for Special Analytical Services (i.e., SAS only) then the SAS Packing List replaces both the Organic and Inorganic Traffic Reports.

Complete one form per laboratory, per shipment. It is not necessary to include a SAS Packing List in each cooler.

Area 1 - SAS Number is assigned by SMO when the sample management coordinator initiates the sample project. The SAS Number should also appear on the Custody Record. All Region 9 SAS numbers end in Y; contact the RSCC for your SAS number.

Area 2 - Sampling Office is Region 9 plus the sampler's office, e.g., Rg 9 - E&E. The head sampler puts his/her name and office phone number in the provided space.

Area 3 - Sampling Date(s) for the samples shipped.

Area 4 - Date samples shipped to laboratory.

Area 5 - Put the site name or code. This space does not go through to the lab copy.

Area 6 - Shipping address for the laboratory.

Area 7 - Sample numbers are created by the sampler. Each sample must be assigned a <u>unique</u> sample number that included the SAS number as a prefix, followed by a consecutive two or three digit number. For example, if the SAS number is 3441Y for a three sample shipment, the sample numbers would be 3441Y-01, 3441Y-02, and 3441Y-03. This number must also be placed on the chain-of-custody in place of the Traffic Report numbers.

Area 8 - Sample Description must include the following information sequentially: Concentration, Matrix, Analysis (i.e., medium soil for Boron). The sample preservation must also be included on the form; this information can be added to the unused lines at the bottom of the form.

CHAIN-OF-CUSTODY RECORD

Use this form with all sample shipments. Enclose one Chain-of-Custody form in each cooler being shipped.

Project Name: Use the SMO assigned CASE/SAS number. Do not give the actual Project Name!

Samplers: Sampler(s) sign here.

STA. NO.: (Optional) Any number that is appropriate.

Date and Time: Both must be included.

Comp/Grab: Mark if the sample is a composite (a sample composed of more than one discrete sample) or a grab (a discrete sample).

Station Location: Use the station location abbreviation that was used in the sample plan to designate sampling locations on the maps and tables.

No. of Containers: Write in the number and size of containers. If necessary, use more than one row for each sample.

Slanted Lines: Write the analyses requested on the slanted lines and check the boxes below for the analyses requested on each individual sample.

Remarks: Write in the traffic report or SAS sample numbers corresponding to each station location number.

Write the name of the laboratory in the upper right corner, above the word REMARKS.

Signature Boxes: The person who turns the samples over to the shipper signs and dates in the first relinquished by box. **This persons signature must be included in the "Samplers" box.** Write in the airbill number in the first "Received by" box.

FIELD QA/QC SUMMARY FORM

Complete one form per lab, per matrix for each sampling event, or with long-term projects, complete a form(s) after every month of sampling. Complete all appropriate sections.

Section IV duplicate types are defined below:

a = Composite split: Duplicate samples collected in an intermediate vessel, homogenized, and then split into separate samples.

b = Consecutive: Duplicate samples collected one after the other from a flowing source, e.g., ground water samples collected with a pump.

c = Colocated: Duplicate samples collected at the same location from a source that is not flowing, e.g., ambient air or grab samples from ponds.

DISTRIBUTION OF COPIES

The following is a form by form detail of copy distribution:

1. **Chain-of-Custody Record** - original accompanies samples, pink copy to QAMS, and a photo copy for sampler's files.

2. **Traffic Reports** - original to SMO, second copy (pink) to QAMS, third and fourth copies accompany samples and a photo copy for sampler's files.

3. **SAS Packing List** - top copy (white) to SMO, second copy (yellow) to QAMS, third (Pink) and fourth (gold) copies go with the samples, and a photo copy for sampler's files.

4. **Field QA/QC Summary Form** - Original to QAMS, and a photo copy for sampler's files.

QAMS address is:

U.S. EPA Region 9
Quality Assurance Mgmt Section
(P-3-2)
215 Fremont St.
San Francisco, CA 94105
Attn: RSCC

SMO address is:

Sample Management Office
P.O. Box 818
Alexandria, VA 22313

CALLING IN SHIPPING INFORMATION

Samplers are required to call the RSCC in the Region 9 Quality Assurance Management Section on the day or day after any samples are shipped to a CLP or EPA laboratory. The RSCC's number is 415/974-0925. If the RSCC is unavailable, call the SMO Region 9 Coordinator at (703)557-2490. If you were planning to ship but did not, you must also call in.

The following information must be provided to the RSCC:

A. Number of samples shipped for each matrix and the date shipped.

B. Name of lab(s) samples were shipped to.

C. Airbill number(s).

D. The next scheduled sampling date.

E. Any significant changes to the sampling schedule or the sample plan.

F. If samples will be shipped on a Friday, the above information must be called in before 12:00 noon on Friday.

USEPA CONTRACT LABORATORY PROGRAM
SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22313
703/557-2490 FTS-557-2490

CASE NO: 10377 | SAS NO. (IF APPLICABLE) 4004Y

ORGANIC TRAFFIC REPORT
(FOR CLP USE ONLY)

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA SI ESI (RIES) RD RA ER
NPLD O&M OTHER _____
NON-SUPERFUND—_____PROGRAM

SITE NAME: BMI (DOES NOT GO THROUGH TO LAB COC)

CITY, STATE: HENDERSON, NV
SITE SPILL ID: 32

REGION NO: 9
SAMPLING COMPANY ② NATURE CO.

SAMPLER: (NAME) IRMA DOE

SHIP TO: ③
ROCKY MTN ANALYTICAL
4955 YARROW ST.
ARVADA, CO 80002

ATTN: KATHY HUTCHINSON

SAMPLING DATE: ④
BEGIN: 1/13/89 END: 1/13/89

DATE SHIPPED: 1/13/89 CARRIER: F ⑤

AIRBILL NO: 123-123-1234

SAMPLE DESCRIPTION ⑥
(ENTER IN BOX A)
1. SURFACE WATER
2. GROUND WATER
3. LEACHATE
4. SOIL
5. SEDIMENT
6. OIL (SAS)
7. WASTE (SAS)

TRIPLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE

SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	Ⓐ SAMPLE DESCRIPTION (FROM BOX 1) 1 2 3 4 5 6 7	Ⓑ CONCENTRATION L - LOW/MED H - HIGH (SAS)	Ⓒ RAS ANALYSIS: VOLATILE	BASE/NEUT /ACID	PESTICIDE /PCB's		Ⓓ SPECIAL HANDLING	Ⓔ STATION LOCATION
YC 301	2	L	X	X			AB LABCC	GW10
YC 302	2	L	X	X			AB	GW11
YC 303	2	L	X	X			AB	GW12
YC 304	2	L	X	X			AB	GW22
YC 305	4	L	X	X			B LABCC	SS01
YC 306	4	L	X	X			B	SS02
YC 307	4	L	X	X			B	SS03
YC 308	4	L	X	X			B	SS04
YC 309	4	L	X	X			B	SS14

A = low detection limits for volatiles

B = 21 DAY TURNAROUND

ALL WATER VOA SAMPLES PRESERVED WITH HCl

EPA Form 2075-7 (8-87)

WHITE — SMO COPY PINK — CLIENT COPY WHITE — LAB COPY FOR RETURN TO SMO YELLOW — LAB COPY

SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22313
703/557-2490 FTS-557-2490

CASE NO: 10577 | (IF APPLICABLE) 7004

INORGANIC TRAFFIC REPORT
(FOR CLP USE ONLY)

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA SI ESI (RIFS) RD RA ER
NPLD O&M OTHER _____
NON-SUPERFUND—_____ PROGRAM

SITE NAME: BMI

CITY, STATE: HENDERSON, NV
SITE SPILL ID: 32

REGION NO: 9
SAMPLING COMPANY ②: NATURE CO
SAMPLER: (NAME) IRMA DOE

SHIP TO: ③
VERSAR
6850 VERSAR CTR
SPRINGFIELD, VA
22151
ATTN: JANET BECKMAN

SAMPLING DATE: ④
BEGIN: 1/13/89 END: 1/13/89

DATE SHIPPED: 1/13/89 CARRIER: F ⑤
AIRBILL NO: 123-123-1244

SAMPLE DESCRIPTION ⑥
(ENTER IN BOX A)
1. SURFACE WATER
2. GROUND WATER
3. LEACHATE
4. SOIL
5. SEDIMENT
6. OIL (SAS)
7. WASTE (SAS)

DOUBLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE

SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	Ⓐ SAMPLE DESCRIPTION (FROM BOX 1) 1 2 3 4 5 6 7	Ⓑ CONCENTRATION L = LOW M = MED H = HIGH (SAS)	Ⓒ RAS ANALYSIS: TOTAL METALS	CYANIDE	DISSOLVED METALS	HIGH ONLY (SAS): SULFIDE	pH	CONDUCTIVITY	OXIDANTS	Ⓓ SPECIAL HANDLING	Ⓔ STATION LOCATION
MYB 990	2	L	X							AB LAB ΦC	GW10
MYB 991	2	L	X							AB	GW11
MYB 992	2	L	X							AB	GW12
MYB 993	2	L	X							AB	GW22
MYB 994	4	M	X							B LAB ΦC	SS01
MYB 995	4	M	X							B	SS02
MYB 996	4	M	X							B	SS03
MYB 997	4	M	X							B	SS04
MYB 998	4	M	X							B	SS14
A: NITRATE / NITRITE											
B: 21 DAY TURNAROUND											
NITRATE / NITRITE PRESERVED WITH H_2SO_4											
METALS WATER SAMPLES PRESERVED W/ HNO_3											

EPA Form 2075-6 (8-87)

U.S. ENVIRONMENTAL PROTECTION AGENCY
CLP Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313
Phone: 703/557-2490 - FTS/557-2490

(1) SAS Number: 2525Y

SPECIAL ANALYTICAL SERVICE

PACKING LIST

(2) Sampling Office: BG 9, ZSZ Sampling Contact: JOE DOE (name) 415/777-7777 (phone)	(3) Sampling Date(s): 7/25/88 (4) Date Shipped: 7/25/88 (5) Site Name/Code: OII	(6) Ship To: SILVER VALLEY ONE GOVERNMENT GULCH KELLOGG, ID 83837 Attn: COLLEEN BRAUN	For Lab Use Only Date Samples Rec'd: Received By:

(7) Sample Numbers	(8) Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1. 2525Y-01	low/water for Analyses A	
2. 2525Y-02	low/water for Analyses A - use for lab QC	
3. 2525Y-03	low/water for Analyses A	
4. 2525Y-04	low/water for Analyses A	
5. 2525Y-05	low/water for Analyses A	
6. 2525Y-06	low/water for Analyses A	
7. 2525Y-07	med/soil for EP TOX METALS	
8. 2525Y-08	med/soil for EP Tox metals	
9. 2525Y-09	med/soil for EP Tox metals	
10. 2525Y-10	med/soil for EP Tox metals - use for lab QC	
11.		
12.		
13.		
14.		
15. Analyses A =	Chloride, Sulfate, Nitrate/Nitrite,	
16.	Flouride, TDS, Conductivity, pH	
17. Preservation:	Nitrate/Nitrite preserved w/ H_2SO_4	
18.		
19.		
20.		

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

REGION 9
215 Fremont Street
San Francisco, California 94105

CHAIN OF CUSTODY RECORD

PROJ. NO.

PROJECT NAME: 2097/11664

SAMPLERS: (Signature) Rodger L. Jones

RMAL

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	METALS	CN-	TOC				REMARKS
													SAMPLE #
006	9/28	8:00		X	MW-1	2x1ℓ	X	X					MY 0009
						1x40z			X				
007	9/28	8:30		X	MW-2	2x1ℓ	X	X					MY0010
						1x40z			X				
008	9/28	11:00		X	MW-3	4x1ℓ	X	X					MY0011 USE FOR LAB QC
						2x40z			X				
009	9/28	11:30		X	MW-4	2x1ℓ	X	X					MY0012
						1x40z			X				
010	9/28	12:00		X	MW-5	2x1ℓ	X	X					MY0013
						1x40z			X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Rodger L Jones	9/28/84 17:00	AIRBILL NUMBER			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

FIELD QA/QC SUMMARY FORM

Instructions: Complete one form per laboratory and per matrix for each sampling event.

Date: _____ Site: _____

Sampler: _____ Case/SAS #: _____

Office: _____ Laboratory: _____

Phone #: _____

Matrix: (check one) ___Groundwater ___Surface Water ___Surface Soil ___Subsurface Soil ___Air ___Other _____

I. BLANKS

Sample #	Type (circle one)	Date Collected
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____
_____	Equip/Field/Travel	_____

II. BACKGROUND SAMPLES

Sample #	Date Collected
_____	_____
_____	_____
_____	_____
_____	_____

III. LAB QC SAMPLES

Sample #	Date Collected
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

IV. DUPLICATES

Sample #	Matches Sample #	Date Collected	Type (circle one)
_____	_____	_____	a/b/c/d
_____	_____	_____	a/b/c/d
_____	_____	_____	a/b/c/d
_____	_____	_____	a/b/c/d
_____	_____	_____	a/b/c/d
_____	_____	_____	a/b/c/d

a = composite split
b = consecutive
c = colocated
d = consecutive soil sleeves

V. Checklist of Field Problems Encountered

	Sample #/ Date(s) of Occurrence /Comments
None	
Pumping Equipment Problems	_____
Sample Filtering Problems	_____
Less Than Required Sample Volume	_____
Low Flow/Recharge Rates	_____
Preservation Problem	_____
Sample Shipment Delay	_____
Federal Express Delay	_____
Other	_____

Additional Explanation (on the back of the form or attach a page)

Appendix E
EXAMPLES OF FIELD LOGBOOKS

GROUNDWATER QUALITY SAMPLING DIARY

PROJECT: _____

_____

_____

_____

INCLUSIVE DATES:

FROM _____ TO _____

BOOK NO. ____

Capacities of Well Casing

Diameter of Holes — Inches	Gallons per Linear Foot	Sacks of Cement per Linear Foot	Linear Feet per Sack of Cement	Cubic Yard of Grout to Fill 100′ of Hole
1¼″	0.064	0.007	137.8	.03
2″	0.163	0.020	50.2	.08
3″	0.367	0.031	32.1	.18
4″	0.653	0.079	12.6	.32
5″	1.020	0.124	8.0	.50
6″	1.468	0.178	5.6	.73
8″	2.611	0.337	3.2	1.3
10″	4.080	0.496	2.0	2.0
12″	5.875	0.714	1.4	2.9
14″	7.996	.972	1.03	4.0
16″	10.448	1.270	0.78	5.2
18″	13.219	1.606	0.62	6.5
20″	16.320	1.983	0.50	8.1
24″	23.501	2.856	0.36	11.6
30″	36.720	4.462	0.22	18.2
36″	52.877	6.426	0.15	26.2

One sack cement = 1.1 foot^3

ORDER OF PREFERRED SAMPLE COLLECTION

1. Volatile organics (VOA)
2. Purgeable organic carbon (POC)
3. Purgeable organic halogens (POX)
4. Extractable organics
5. Pesticide/Herbicide
6. Dibenzofuran/Dioxin
7. Total metals
8. Dissolved metals
9. Total organic carbon (TOC)
10. Total organic halogens (TOX)
11. Phenols
12. Cyanide
13. Nitrate and Ammonia
14. Sulfate and chloride
15. Nitrate and ammonia
16. Radionuclides

RCRA TEGD 1986

GROUNDWATER SAMPLING
FIELD DATA SHEET

WELL NUMBER _____ FIELD TEAM (INITIALS) _____

SITE _____ JOB NUMBER _____

FIELD CONDITIONS _____

_____

FIELD MEASUREMENT/ COLLECTION EQUIP.	MAKE/MODEL	SERIAL/ID NO.	CALIBRATION/ COMMENTS
pH METER			
CONDUCTIVITY METER			
THERMOMETER			
WATER LEVEL INDICATOR			
BAILER/PUMP			

DECONTAMINATION

_____

_____

PURGE INFORMATION

DATE _____ START TIME _____ END TIME _____

INITIAL DEPTH TO WATER _____ WELL DEPTH _____ EST. WELLBORE VOL _____

FINAL DEPTH TO WATER _____ TOTAL VOL. PURGED _____ DISCHARGE RATE _____

METHOD _____ PUMP DEPTH _____

VOLUME PURGED	TEMPERATURE	pH	CONDUCTIVITY	APPEARANCE

SAMPLING INFORMATION

DATE _____ START TIME _____ END TIME _____

METHOD _____

INITIAL DEPTH TO WATER _____ DEPTH TO WATER AFTER SAMPLING _____

FIELD MEASUREMENTS

REPLICATE NO. *	TEMP	pH	CONDUCTIVITY	APPERANCE/COMMENTS
1.				
2.				
3.				
4.				

SHIPPING INFORMATION

SAMPLE NO.	LABORATORY	CARRIER	SHIPPING DATE	SHIPPING NO.

COMMENTS/EXCEPTIONS TO SAP AND QAPP

* RCRA replicates should be measured following complete purge.

Appendix F
CH2M HILL SITE SAFETY PLAN

CH2M HILL HEALTH AND SAFETY PLAN

This plan will be kept onsite during field activities and will be reviewed and updated as necessary. This plan adopts, by reference, the standards of practice (SOP) contained in the CH2M HILL *Waste Management and Industrial Processes Discipline Health and Safety Manual, Volumes 1 and 2*, and other applicable CH2M HILL SOPs as appropriate. The Site Safety Coordinator (SSC) is to be familiar with these SOPs. In addition, this plan adopts procedures contained in the work plan for the project.

1.0 PROJECT INFORMATION AND DESCRIPTION

CLIENT: U.S. EPA **PROJECT NO:** SFO69114.FI.SC

OWNER: National Priority List **OFFICE:** SFO

PROJECT MANAGER: Sybil Hatch

SITE NAME: San Fernando Valley, California

SITE ADDRESS: Four National Priority List (NPL) Sites - North Hollywood, Crystal Springs, Pollock, and Verdugo

DATE(S) OF INITIAL VISIT: March 1988 through January 1989

DATE(S) OF SITE WORK: November 1991 through January 1993

SITE ACCESS:

Varies with location. The overall well locations are shown in Figure 2 of the Work Plan. Locations for individual cluster wells and VPBs, including street names and dimensions, are provided in Appendix A.

SITE SIZE: 122,800-acre area

SITE TOPOGRAPHY: Varies with location.

SITE DESCRIPTION AND HISTORY:

The San Fernando Valley Basin contains four National Priority List (NPL) sites: North Hollywood, Crystal Springs, Pollock, and Verdugo (Figure 1). The primary groundwater contaminants within these areas consist of the volatile organic compounds trichloroethene and perchloroethene. As part of Remedial Investigation work in the basin, 15 cluster well sites containing 44 individual monitoring wells screened at different depths and 43 shallow monitoring wells (VPBs) were installed throughout the basin (Figure 2). The Los Angeles Department of Water and Power conducted two quarterly sampling events in the basin during January and April 1991. Well data are provided in Appendix B.

Land use on the four NPL sites consists primarily of residential and urban areas. The climate is semiarid and typical of Southern California.

THIS PAGE RESERVED FOR MAP

2.0 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

2.1.1 Monitoring Well Pump Installations - Transporting Purged Well Water
2.1.2 Monitoring Well Pump Installations - Installing Submersible Pumps

2.2 DESCRIPTIONS OF TASKS

2.2.1 The work to be performed consists of providing a vacuum truck and crew to transport purged well water from 73 monitoring wells during dedicated pump installation and 87 monitoring wells during quarterly and annual sampling events. Purged well water will be transported to the LADWP's North Hollywood Aeration Facility (NHAF), and will be transferred to storage tanks provided by the subcontractor at the NHAF.

The work consists of, but is not limited to, the following:

a. Providing a 5,000-gallon vacuum truck and crew to obtain purged well water directly from wells.

b. Transporting and transferring the purged well water and decontaminate rinsate into storage tanks at LADWP's NHAF.

c. Providing three 21,000-gallon storage tanks at LADWP's NHAF.

d. Providing these services for others during (1) dedicated pump installation and testing and (2) quarterly well monitoring program.

2.2.2 The work to be performed consists of installing dedicated submersible pumps for purging the wells, dedicated bladder pump for sampling the wells, and accessories for 73 existing monitoring wells.

The work consists of, but is not limited to, the following:

a. Install dedicated submersible pump, associated column piping, and motor leads.
b. Install dedicated bladder pump and associated tubing.
c. Install sounding pipe.
d. Install new top of well casing compression seal.
e. Conduct a 30-minute performance test of both pumps.
f. Clean and restore the site.

2.2.3 Included in the work is decontamination, cleanup, and other elements as specified.

2.3 NAME AND ROLE OF SUBCONTRACTOR FIRMS

Not known

3.0 HAZARD EVALUATION AND CONTROL

3.1 HEAT AND COLD STRESS *(Reference CH2M HILL SOP HS-09)*

3.1.1 GUIDELINES FOR WORKING IN TEMPERATURE EXTREMES WHILE WEARING PERSONAL PROTECTIVE EQUIPMENT (PPE)

Temperature	Work Cycle	Rest Cycle	Control Measures
<32° F or <55° F & raining	2 hrs	15 min	Review cold stress in safety meeting. Rest in a warm area. Drink at least 8 ounces of warm non-caffeinated, non-alcoholic beverage at each rest break. Schedule a mid-day lunch break of at least 30 minutes in a warm area to begin not later than 5 hours after startup.
72° to 77° F	2 hrs	5 min	Review heat stress in safety meeting. Take resting pulse rate before beginning work. Drink 8 ounces of cool water before beginning work, and 4 ounces at rest break. Have ice available.
77° to 82° F	2 hrs	5 min	As above, but seated rest break. Monitor pulse rate. (See below.)
82° to 87° F	60 min	15 min	As above, but rest area to be shaded.
87° to 90° F	30 min	15 min	As above. Try to provide a shaded work area.
>90° F	15 min	15 min	As above. Provide a shaded area with seats in the work area for team members to use as needed. Try to reschedule work to avoid mid-day heat.

PULSE CRITERIA. Take resting radial (wrist) pulse at start of work day; record it. Measure radial pulse for 30 seconds as rest period begins. Pulse not to exceed 110 beats per minute (bpm), or 20 bpm above resting pulse. If pulse exceeds this criteria, reduce work load and/or shorten the work cycle by one third, and observe for signs of heat stress. No team member is to return to work until his/her pulse has returned to <110 bpm, or resting pulse +20 bpm.

3.1.2 SYMPTOMS AND TREATMENT OF HEAT AND COLD STRESS

Heat Stroke	Heat Exhaustion	Frostbite	Hypothermia
Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high body temperature.	Pale, clammy, moist skin; profuse sweating; weakness; normal temperature; headache; dizzy; vomiting.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Cool victim rapidly by soaking in cool (not cold) water. Get medical attention immediately!!	Remove victim to a cool, air conditioned place. Loosen clothing, place in head low position. Have victim drink cool (not cold) water.	Remove victim to a warm place. Rewarm area quickly in warm (not hot) water. Have victim drink warm fluids--not coffee or alcohol. Do not break any blisters. Elevate the injured area and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids--not coffee or alcohol. Get medical attention.

3.2 PHYSICAL (SAFETY) HAZARDS AND CONTROLS *(Reference CH2M HILL SOP HS-03)*

Hazard	Engineering or Administrative Controls
Flying debris/objects	Provide shielding and PPE.
Noise > 85 dBA	Noise protection and monitoring required.
Steep terrain/unstable surface	Brace and shore equipment.
Build-up of explosive gases	Provide 20 lb A.B.C fire extinguisher and ventilation.
Build-up of static electricity	No spark sources within 50 feet of an excavation, heavy equipment, or UST removal. Ground as appropriate.
Gas cylinders	Make certain gas cylinders are properly anchored and chained. Keep cylinders away from ignition sources.
High pressure hose rupture	Check to see that fitting and pressurized lines are in good repair before using.
Electrical shock	Make certain third wire is properly grounded. Do not tamper with electrical wiring unless qualified to do so.
Suspended loads	Work not permitted under suspended loads.
Moving vehicles	Back-up alarm required for heavy equipment. Observer remains in contact with operator and signals safe back-up. Personnel to remain outside of turning radius.
Overhead electrical wires	Heavy equipment (e.g. drill rig) to remain at least 15 feet from overhead powerline for powerlines of 50 kV or less. For each Kv > 50 increase distance 1/2 foot.
Buried utilities, drums, tanks, and so forth	Locate buried utilities, drums, tanks, etc. prior to digging or drilling and mark location.
Slip, trip, fall hazards due to muddy work areas	Use wood pallets or similar devices in muddy work areas.
Back injury	Use proper lifting techniques, or provide mechanical lifting aids.
Confined space entry	Permit and safety plan required (reference CH2M HILL SOP HS-17).
Trenches/excavations	Cal/OSHA permit required to trench or excavate. Make certain trench meets Cal/OSHA standard before entering. All excavations > 5 feet deep must be sloped or shored. Excavations > 4 feet deep must have a ladder every 25 feet. If not entering trench, remain 2 feet from edge of trench at all times.
Protruding objects	Flag visible objects.

3.3 LOCATIONS OF BURIED UTILITIES

Because of the urban nature of the setting, utilities may be present at specific investigative sites.

3.4 HAZARDS POSED BY CHEMICALS BROUGHT ONSITE

Refer to CH2M HILL *Hazard Communication Program Manual* which is available from the Corporate Human Resources Department in Denver. The Project Manager is to request Material Safety Data Sheets (MSDSs) from the client, or contractors and subcontractors for chemicals that CH2M HILL employees are potentially exposed to.

Chemical	Location
Isobutylene	Calibration Gas HNU Monitor
Nitric Acid	Water Sampling
Sulfuric Acid	Water Sampling

3.5 KNOWN CONTAMINANTS OF CONCERN

Contaminant	Location and Highest Concentration (solid media: mg/kg or liquid media: ug/l)	PEL, REL, or TLV (ppm)	IDLH (ppm)	Symptoms and Effects of Exposure	PIP
Trichloroethylene (TCE)	GW	25/25/50	1,000	Headache, vertigo, visual disturbance	
Perchloroethylene (PCE)	GW	50/25/50	500	Irritation--eye, nose, throat	
Methyl Chloroform	GW	350/350/350	1,000	Headache, lassitude, CNS depressant	
Benzene	GW	10/0.1/10	3,500	Irritation--eyes, nose, respiratory system	
Carbon Tetrachloride	GW	5/2/5	300	CNS depressant, nausea, vomiting	

Note 1: Lower value of PEL, REL, or TLV listed.
Note 2: NL = no limit found in reference materials.
Note 3: PIP = photoionization potential.
Note 4: Location refers to physical location. Abbreviations specify media:
A (AIR) D (DRUMS) F (FLASH) GW (GROUNDWATER) L (LAGOON) TK (TANK)S (SOIL)
SL (SLUDGE) SW (SURFACE WATER)

3.6 POTENTIAL ROUTES OF EXPOSURE

DERMAL:	INHALATION:	OTHER:
Secondary for all contaminants of concern	Primary for all contaminants of concern	Ingestion

4.0 PERSONNEL

4.1 CH2M HILL EMPLOYEES *(Reference CH2M HILL SOP HS-01 and HS-02)*

Employees listed below are enrolled in the CH2M HILL chemical protection program (CPP) and meet the medical surveillance, 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training requirements of OSHA 29CFR1910.120. Employees designated "SSC" have received 8 hours of supervisor and 8 hours of instrument training and can serve as site safety coordinator (SSC) for the level of protection indicated. There must be one SSC present during any task performed in exclusion or decontamination zones with the potential for exposure to safety and health hazards. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. There must be one FA-CPR designated employee present during any task performed in exclusion or decontamination zones with the potential for exposure to safety and health hazards. The "buddy system" requirements of OSHA 29CFR1910.120 are to be met at all times.

Employee Name	Office	Responsibility	SSC/FA-CPR
Ken Starr	PHS	Field Team Leader	
Loren Krook	RDD	Site Safety Coordinator	SSC: FA-CPR
Jess Brown	RDD		FA-CPR
Jeff Franklin	BOI		FA-CPR
Bob Treble	ANC		FA-CPR
Willie Paiz	PHX		FA-CPR
Dan Wendell	LAO		FA-CPR
Sybil Hatch	SFO		FA-CPR

4.2 HEALTH AND SAFETY AND FIELD TEAM CHAIN OF COMMAND

4.2.1. CLIENT

Chris Stubbs - EPA Region IX

4.2.2 CH2M HILL

Sybil Hatch - SFO

4.3.3 SUBCONTRACTOR

Unknown

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) SPECIFICATION[1]

Task	Level	Body	Foot	Head[2]	Eye	Hand	Respiratory
5.1 INSTALLING PUMPS AND EQUIPMENT 5.2 TRANSPORTING AND TRANSFERRING PURGED WELL WATER 5.3 WELL MONITORING	D	Coveralls	Safety boots/ shoes	Hardbat	Safety glasses or chemical splash goggles	Supported Polyvinyl Alcohol gloves	None required

Note 1: Reference CH2M HILL SOP HS-07 and HS-08.
Note 2: The SSC shall specify hardbat areas.

5.1 MODIFICATIONS AND ADDITIONS TO PPE SPECIFICATION

The atmosphere contains no known hazard. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

6.0 AIR MONITORING EQUIPMENT SPECIFICATION[5]

Instrument	Tasks	Action Levels		Frequency	Calibration
CGI:	All	0-10% LEL 10-25% LEL >25% LEL	No exp.[3] hazard Pot.[4] exp. hazard Exp. hazard; evacuate/vent	Every 30 minutes	Daily. Record calibration in SSC log book.
0_2 meter:	All	>25.0% O_2 20.9% O_2 <19.5% O_2	Exp. hazard; evacuate/vent Normal O_2 O_2 def.; evacuate/vent	Every 30 minutes	Daily. Record calibration in SSC log book.
Photoionization Detector (PID): 11.7 ev	All	Background ppm[ab1] >5 ppm[ab] 5-10 ppm[ab] >10 ppm[ab]	Level D Level C (Continuous for 2-3 minutes) Level B Stop work; re-evaluate	Every 30 minutes	Daily before and after each day's use. Record calibration in SSC log book

Note 1: ab = above background
Note 2: N/A = not applicable
Note 3: exp. = explosion
Note 4: pot. = potential
Note 5: Reference CH2M HILL SOP HS-06

6.1 CALIBRATION SPECIFICATION				
Instrument	**Gas**	**Span**	**Reading**	**Method**
PID: HNU, 10.2 ev probe	100 ppm isobutylene	9.8 ± 2.0	55 ppm	1.5 l/m reg T-tubing 0.25 l/m reg direct tubing
PID: HNU, 11.7 ev probe	100 ppm isobutylene	5.0 ± 2.0	68 ppm	1.5 l/m reg T-tubing 0.25 l/m reg direct tubing
FID: OVA-128	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 l/m reg T-tubing
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5 % LEL	1.5 l/m reg direct tubing

6.2 AIR SAMPLING
Method and Description: Initial monitoring will be performed at monitoring well sampling locations.
Personnel: All
Area: All
Results to be interpreted by: Site Safety Coordinator

7.0 DECONTAMINATION SPECIFICATION *(Reference CH2M HILL SOP HS-13)*

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse	• Wash/rinse equipment	• Power wash
• Glove wash/rinse	• Solvent rinse equipment	• Steam clean
• Respirator removal	• Solvent disposal method: Contain collected material	• Water disposal method: Contain collected material
• Outer glove removal	• Final disposal is the responsibility of the SSC	• Final disposal is the responsibility of the SSC
• Body suit removal		
• Inner glove removal		
• Hand wash/rinse		
• Face wash/rinse		
• Shower ASAP		

8.0 SPILL CONTAINMENT PROCEDURES

Keep unnecessary people away. Stay upwind; keep out of low areas. Stop leak if you can do it without risk. Small spills - Take up with sand, earth or other noncombustible absorbent material. Large spill - Dike far ahead of liquid spill for later disposal, call for emergency assistance.

9.0 WORK PROCEDURES

9.1 WORK PRACTICES

- No spark sources within exclusion or decontamination zones.
- Avoid visibly contaminated areas.
- No eating, drinking, or smoking in contaminated areas, or exclusion or decontamination zones.
- SSC to establish areas for eating, drinking, smoking.
- No contact lenses in exclusion or decontamination zones.
- No facial hair that would interfere with respirator fit if Level C or B is anticipated.
- Site work will be performed during daylight hours whenever possible. Any work conducted during hours of darkness will require enough illumination intensity "to read a newspaper without difficulty."

9.2 SITE CONTROL MEASURES

- Site safety coordinator (SSC) to conduct site safety briefing (see below) before starting field activities, or as tasks and site conditions change.
- SSC records safety briefing attendance in logbook, and documents topics discussed.
- Post Cal/OSHA job site poster in a central and conspicuous location at the site.
- Determine wind direction.
- Establish work zones: support, decontamination, and exclusion zones, and delineate work zones with flagging or cones as appropriate. Support zone upwind of site.
- Establish decontamination procedures, including respirator decontamination procedures, and test.
- Utilize access control at the entry and exit from each work zone.
- Chemicals to be stored in proper containers.
- MSDSs are available for onsite chemicals employees exposed to.
- Establish onsite communications. These should consist of:
  - Line of sight/hand signals
  - Air horn
  - Two-way radio or cellular phone if available
- Establish emergency signals. For example:
  - Grasping throat with hand--EMERGENCY--HELP ME
  - Grasping buddy wrist--LEAVE AREA NOW
  - Thumbs up--OK, UNDERSTOOD
  - Two short blasts on air horn--ALL CLEAR
  - Continuous air horn--EMERGENCY--EVACUATE
- Establish offsite communications.
- Establish "buddy" system.
- Establish procedures for disposal of material generated onsite.
- Initial air monitoring conducted by SSC in appropriate level of protection.
- SSC to conduct periodic inspections of work practices to determine effectiveness of this plan. Deficiencies to be noted, reported to DSO or RSO, and corrected.

10.0 EMERGENCY RESPONSE PLAN *(Reference CH2M HILL SOP HS-12)*

10.0 PRE-EMERGENCY PLANNING

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency service providers as appropriate.

- Locate nearest telephone to the site and inspect onsite communications.
- Locate chemical, safety, radiological, biological hazards.
- Confirm and post emergency telephone numbers and route to hospital.
- Post site map marked with location of emergency equipment and supplies.
- Review emergency response plan for applicability to any changed site conditions, alterations in onsite operations, or personnel availability.
- Evaluate capabilities of local response teams.
- Where appropriate and acceptable to the client, inform emergency room/ambulance service and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment and supplies.
- Review emergency procedures for personnel injury, exposures, fires, explosions, chemical and vapor releases with field personnel.
- Locate onsite emergency equipment and supplies of clean water.
- Verify local emergency contacts, hospital routes, evacuation routes, and assembly points.
- Drive route to hospital.
- Review names of onsite personnel trained in first aid and CPR.
- Review notification procedures for contacting CH2M HILL's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once prior to site activities.
- Brief new workers on the emergency response plan.

10.2 EMERGENCY EQUIPMENT AND SUPPLIES

The SSC marks the locations of emergency equipment on the site map and posts the map in the support zone.

- 20 lb ABC fire extinguisher
- Industrial first aid kit

10.3 EMERGENCY MEDICAL TREATMENT

- The SSC will assume charge during a medical emergency until the ambulance arrives, or the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR.
- Call the ambulance and hospital.
- Determine if decontamination will make injury worse. Yes--seek medical treatment immediately.
- Make certain that injured person is accompanied to emergency room.
- Notify the Project Manager of the injury.
- Notify the District or Regional Health and Safety Manager.
- Notify the injured person's human resources department.
- Prepare an incident report. Submit this to the Corporate Director Health and Safety (WDC) and Corporate Human Resources Department (DEN) within 48 hours.

10.4 EVACUATION

- Evacuation routes will be designated by SSC prior to beginning of work.
- Onsite and offsite assembly points will be designated prior to beginning of work.
- Personnel will exit the exclusion zone and assemble at the onsite assembly point upon hearing the emergency signal for evacuation of the exclusion zone.
- Personnel will assemble at the offsite point upon hearing the emergency signal for a site evacuation.
- The SSC and a "buddy" will remain onsite after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- SSC accounts for all personnel in the onsite assembly zone.
- A person designated by the SSC (prior to work) will account for personnel at the offsite assembly area.
- The SSC is to write up the incident as soon as possible after it occurs, and submit a report to the Corporate Director Health and Safety.

10.5 EVACUATION ROUTES AND ASSEMBLY POINTS

Thomas Brothers Map page number(s) are provided for hospital information. Maps will be in the possession of the SSC and in the case of an emergency, an appropriate route will be selected on traffic, distance, and other considerations.

11.0 EMERGENCY RESPONSE TELEPHONE NUMBER

In the event of fire, explosion, or chemical release, evacuate team members to a safe upwind distance and call the fire department. When reporting an incident to the fire department, do not hang up until specifically told to do so by the dispatcher. The SSC should meet the incoming fire responders and answer their questions about the incident. Call the EPA client and project manager as soon as practicable.

Local

Ambulance, Fire and Rescue, Paramedic, Highway Patrol: 911

Hospitals: (Specific site, Phone number, Thomas Bros. Map Page No.) Ex: Valley Hospital Medical Center, North Hollywood Site, 818/997-0101, 15D-3

Emergency Room Facility	Telephone No.	Thomas Bros. Map Page No.
Valley Hospital Medical Center 14500 Sherman Circle Van Nuys, California (North Hollywood Site)	818/997-0101	15 D-3
Medical Center of North Hollywood 12629 Riverside Drive North Hollywood, California (North Hollywood Site)	818/980-9200	23 B-2
St. Joseph Medical Center Buena Vista and Alameda Streets Burbank, California (North Hollywood, Crystal Springs Sites)	818/843-5111	24 C-3
Memorial Hospital of Glendale 1320 S. Central Avenue Glendale, California (Crystal Springs, Pollock Sites)	818/502-1900	25 C-6
Verdugo Hills Hospital 1812 Verdugo Boulevard Glendale, California (Crystal Springs, Verdugo Sites)	818/790-7100	25 F-1
Glendale Adventist Medical Center 1509 Wilson Terrace Glendale, California (Crystal Springs, Pollock, Verdugo Sites)	818/409-8000	25 E-3

Poison Control Center:	911
Police/Sheriff:	911
Fire:	911
Electric Co.:	Southern California Edison: 818/674-6060
Gas Co.:	Southern California Edison: 818/674-6060
Water Co.:	City of Los Angeles Department of Water and Power: 818/481-4211
Airport:	Los Angeles International Airport: 818/646-5252
Explosive Unit:	Same as police

12.0 EMERGENCY CONTACTS

CH2M HILL Medical Consultant Dr. Kenneth Chase Washington Occupational Health Associates 202/463-6698 (8 AM to 5 PM EST) 202/463-6440 (after hours answering service; physician will return call within 30 minutes)	**Occupational Physician (Regional or Local)**
Corporate Director Health and Safety Name: Marty Mathamel/WDC Phone: 703/471-1441	**Site Safety Coordinator (SSC)** Name: Phone:
District Health and Safety Manager (DHSM) Name: Allen Macenski/LAO Phone: 714/250-5522, ext. 372	**Regional Manager** Name: Phone:
Regional Health and Safety Manager (RHSM) Name: Ann Rundle/LAO Phone: 714/250-5522, ext. 370	**Project Manager** Name: Phone:
Radiation Health Manager (RHM) Name: George Stephens/ORO Phone: 615/483-9032	**Regional Human Resources Department** Name: Phone:
Client	**Corporate Human Resources Department** Name: Beth Brown/DEN Phone: 303/771-0952 *If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured. Notification must be made within 24 hours of the injury.*

13.0 PLAN APPROVAL

This site safety plan has been written by CH2M HILL. CH2M HILL claims no responsibility for its use by others, unless specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

PLAN WRITTEN BY: **DATE:**

PLAN APPROVED BY: Allen Macenski **DATE:** 7/29/91

13.1 PLAN AMENDMENTS

DATE: **CHANGES MADE BY:**

CHANGES TO PLAN:

APPROVED: **DATE:**

13.2 PLAN AMENDMENTS

DATE: **CHANGES MADE BY:**

CHANGES TO PLAN:

APPROVED: **DATE:**

14.0 PLAN AMENDMENTS

Attachment 1: Form 533

Attachment 2: Applicable MSDSs